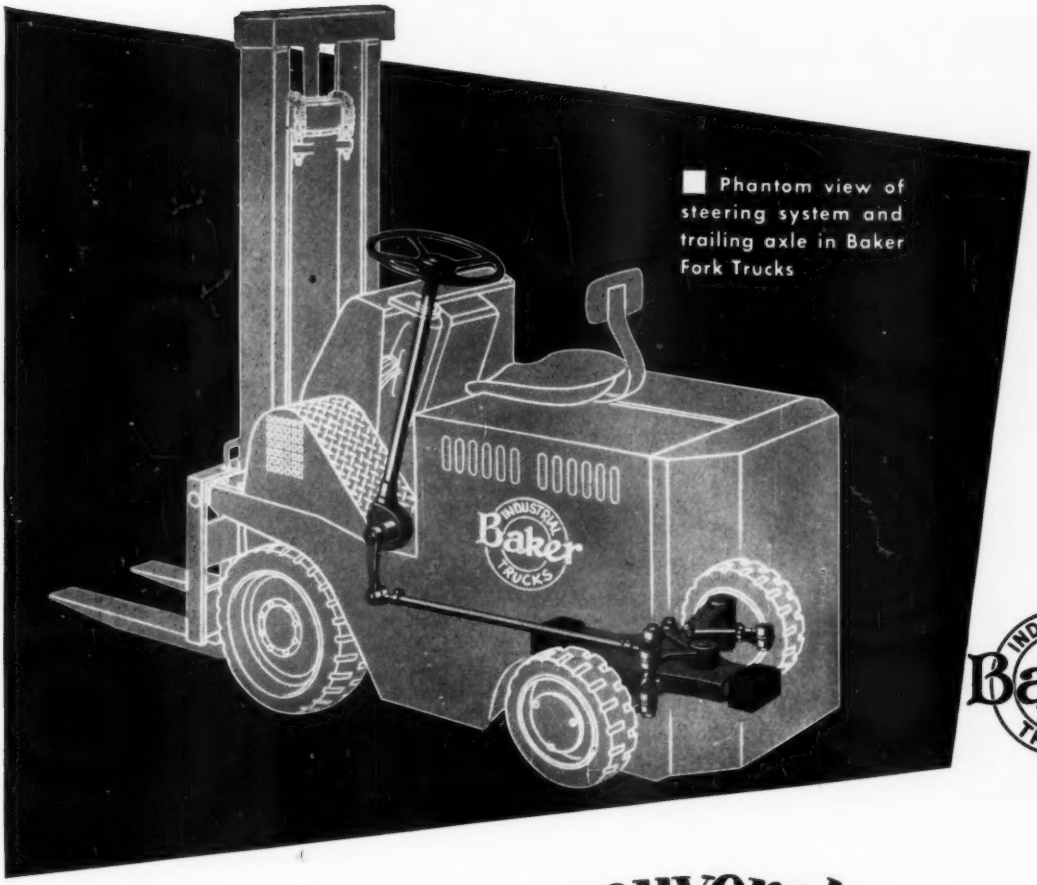

■ Phantom view of steering system and trailing axle in Baker Fork Trucks

INDUSTRIAL Baker TRUCKS

The most maneuverable fork truck

■ Maneuverability ranks high among features essential to efficient fork truck performance. Finger-tip control of steering, ability to make sharper turns and operate in narrower aisles, complete accommodation to uneven roadways, effective snubbing of road shocks — these are some of the qualities engineered into Baker fork trucks which make them the most maneuverable in their class — and less fatiguing to the operator.

Automotive type steering assembly with ball-type joints and anti-friction bearings in the steering linkage give you a truck as easy to handle as your automobile. Proper steering geometry minimizes "scrubbing" of tires. The wide-angle steering axle is mounted longitudinally in jumbo-size rubber blocks. This absorbs road shocks and provides constant, smooth traction and travel despite the most adverse floor conditions.

Write for *your copy of the "Baker Handling Library" a new portfolio of actual case histories.*

THE BAKER-RAULANG COMPANY
1251 WEST 80th STREET · CLEVELAND 2, OHIO

The Baker-Lull Corporation • Subsidiary, Minneapolis, Minn.
Material Handling and Construction Equipment

Baker
industrial trucks

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

It's Booth 603, This Year

PLANT ENGINEERING will have Booth 603 at the Fifth Plant Maintenance and Engineering Show, at the International Amphitheatre, here in Chicago, from January 25 through 28.

Officers Elected for Detroit P. E. Society

AT A RECENT meeting of the Plant Engineers' Society of Detroit, a Constitution was proposed and adopted. Following the adoption of the Constitution, members recommended and voted on the officers for the coming year.

James Henderson, Thompson Products, Inc., was elected president; **George Breisch,** Parke, Davis and Co., was elected vice president; **Burt J. Drummond,** Detroit Steel Products Co., was elected secretary; and **Tom C. Gest,** Republic Steel Corp., was elected treasurer.

Board members will be: **James Briggs,** James Vernor Co.; **K. Mercik,** Bulldog Electric Products Co.; and **D. G. Philp,** Bohn Aluminum and Brass Co.

The Plant Engineers' Society of Detroit meets on the fourth Monday of every month. If other plant engineers in the Detroit area are interested in attending these meetings, they should contact Burt J. Drummond, Plant Engineer, Detroit Steel Products Co., Detroit 11, Michigan.

Personnel Changes

L. H. McReynolds, one of the early contributors to PLANT ENGINEERING and a long time member of The Jeffrey Manufacturing Company's staff, was recently appointed to the position of Manager of Public Relations. In this position Mr. McReynolds will report directly to J. H. Fulford, President of The Jeffrey Manufacturing Co.

James W. Cameron has been appointed Works Engineer for Basic Refractories, Inc., and will be responsible for the company's extensive Maple Grove, Ohio, quarry and burning plant operations.

In his new position, Mr. Cameron will integrate plant maintenance procedures for the quarry, crusher plant and burning plant operations. He will also be in charge of engineering connected with maintenance and construction of new facilities.

New Plants for '54

Caterpillar Tractor Co. will be moving into its new parts depot in Denver, Colorado, the early part of this year . . . **A. O. Smith Corp.** is building an automotive frame plant at Granite City, Illinois . . . **Minnesota Mining and Manufacturing Co.** announced plans to expand the roofing granule manufacturing facilities at Wausau, Wisconsin . . . A two-year expansion and improvement program is nearing completion at **Westinghouse Electric Corporation's** mica plant in Irwin, Pennsylvania . . . Processing of Kodachrome film will be speeded up when **Eastman Kodak** completes its new plant in Fair Lawn, New Jersey . . . Construction is nearly complete on **General Electric Company's** transformer plant in Rome, Georgia . . . Additional assembly, shipping and warehousing space has been added to the Brea, California, plant of **Chiksan Co.** . . . **Westinghouse Electric Corp.** plans to build a plant near Staunton, Virginia, for the manufacture of packaged air conditioning units from 2- to 15-ton capacities.

Course in Spray Painting

INCREASED USE OF spray painting is creating greater requirements for trained personnel. To help meet this need, the Binks Mfg. Co. will conduct a series of Spray Painting Schools in Chicago starting early in January.

The announced dates for the three one-week sessions are as follows: January 4 through January 8, February 1 through February 5, March 1 through March 5.

Under the direction of William Beacham, nationally recognized spray painting authority, every class member takes spray guns apart, re-assembles and tests them. In one session, the students actually produce such finishing defects as blooming, blushing, orange peel, shore line, etc., and learn how to prevent and remedy these errors.

During this five-day course, paint circulating systems, material handling pumps, spray booths, oil and water extractors and catalyst painting equipment are explained and demonstrated.

No tuition is charged; classes, however, are limited to 40. Each student pays his transportation and expenses while in Chicago. Enrollment applications should be made two to four weeks in advance of class dates.

For any further information or reservations address E. F. Watts, Binks Manufacturing Co., 3114-44 West Carroll Ave., Chicago, Illinois.

Lowering Floor Cleaning Costs

"LOWERING COSTS IN FLOOR CLEANING" is the subject for a series of nation-wide, one-day sanitation cost control clinics which will tour the country. Clinics are to be held in 50 cities.

This program is designed for industrial plants, universities, restaurants, railroads, institutions, hotels, dairies, schools, and many others. The national schedule for these one-day cost control clinics begins in Louisville, Kentucky, and will terminate in Richmond, Virginia, on February 25.

Invitations to these clinics are extended to sanitation directors, superintendents of building maintenance, sanitation supervisors, housekeepers, safety directors, in-

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

Here's a *Real*

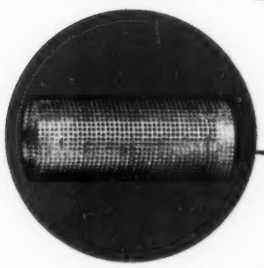
STEAM TRAP PACKAGE

WANT FAST HEAT-UP OF OFF-AND-ON PIPE COILS, HEADERS, UNIT HEATERS, ETC.?

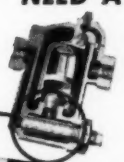
Speed heat-up with Armstrong thermic bucket traps. When steam is first turned on, air is pushed out the large thermic vent—fast! As soon as steam reaches the trap a thermic strip closes the vent, then the bucket functions as a regular bucket. Traps with thermic vent buckets discharge air 50 to 100 times faster than other traps.

NEED A CHECK VALVE AHEAD OF TRAP?

Just specify Armstrong with internal check valve. No check valve installation labor or fittings needed. Spring loaded action and vertical position minimize danger of dirt holding valve open. The Armstrong internal check valve is top quality—long lasting.



NEED A STRAINER AHEAD OF TRAP?



Save money with Armstrong built-in strainer traps. They cost less than a separate trap and strainer and save installation time and money. Stainless steel screen lasts a long time.

Get the full facts about all Armstrong traps. Send today for free Catalog J, The Armstrong Steam Trap Book.

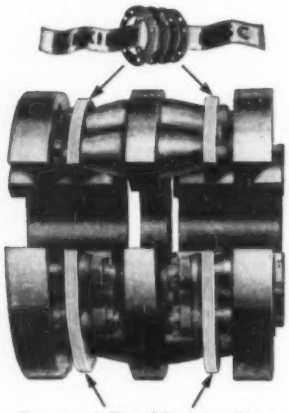
ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

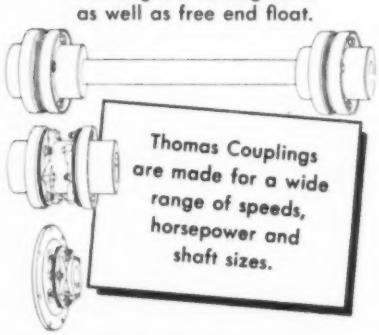
For more facts circle 503 on Reply Card

Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs

DISTINCTIVE ADVANTAGES	
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

NO MAINTENANCE PROBLEMS

ALL PARTS ARE SOLIDLY BOLTED TOGETHER

Write for our new Engineering Catalog No. 51

THOMAS FLEXIBLE COUPLING CO.

WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

dustrial hygienists and members of plant management. The primary emphasis of the clinics will be to develop enthusiasm among the participants to adopt ready-to-use ideas, plans and work tools which are now saving thousands of dollars in many leading programs.

Those wishing to attend a clinic or desiring further program information should write to Industrial Sanitation Counselors, 2934 Cleveland Boulevard, Louisville 6, Kentucky.

Industrial Computing Service

TWO NEW ELECTRONIC "brains" have been added to the other digital and analog computing equipment at the Computer Center of Armour Research Foundation of Illinois Institute of Technology. The facilities of the Computer Center are available to business and industry for solving problems which cannot be solved by the usual technique.

The addition of these two machines at the Computer Center, located at 3201 S. Michigan Ave., Chicago, has enabled the Foundation to reduce the waiting time for the start of work on computational problems from six months to a month.

School on Maintaining Spray Painting Equipment

PERSONNEL ENGAGED IN servicing spray painting equipment may be interested in knowing that The DeVilbiss Co. recently established an equipment service school covering the repair and servicing of spray painting equipment.

Movies, cutaways and other training aids will be used in the school. While the actual spraying of paint with guns will be kept at a minimum, the students will be taught how to use spray patterns for checking gun performance. Greater emphasis will be placed on disassembling spray painting equipment and repair and maintenance techniques.

Class schedules are being arranged and further information about the course may be obtained by writing to the Equipment Service Department, The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio. There is no cost for the class sessions, but the student arranges his own transportation, room and board.

Report on General Motors Fire

THE DISASTROUS FIRE that gutted the huge automobile transmission plant in Livonia, Michigan, last August 12 "could have occurred and still can occur in many other industrial and warehousing operations" in this country.

In its complete report on the General Motors fire, National Fire Protection Association frames this warning to management in pointing up the important lessons provided by the fire.

Stressing the importance of preventing fires of this nature, the report concludes with an outline of recommendations and references to aid executives at all levels in re-assessing the fire safety of their operations.

Copies of this 16 page report may be obtained by writing to the National Fire Protection Association, 60 Batterymarch St., Boston 10, Massachusetts. Price of this report is 25 cents.

Industrial Instruments Course

SCHEDULES for industrial instruments maintenance and repair courses for the first half of 1954 at Minneapolis-Honeywell Regulator Company's Philadelphia training school have been announced by the company's Industrial Division.

Listed again is the 14-week comprehensive class which it offered for the first time last year to include instruction in new devices. Other courses include two five-week sessions and several running up to three weeks.

The 14-week comprehensive course will be held from February 15 to May 21. The two five-week courses will start January 4 and April 26. Shorter courses will start February 15, March 8, April 5, and June 7.

Additional information about these courses may be obtained by writing to the Industrial Division, Minneapolis-Honeywell Regulator Co., 4491 Wayne Ave., Philadelphia, Pennsylvania.

Going to the Luncheon? If So, Let Ted Know

Mr. Ted Ramond, Plant Engineer
Goodman Mfg. Co.
4834 S. Halsted St.
Chicago, Ill.

I plan to attend the Plant Engineers' Societies' Wednesday Noon luncheon on January 27 at Stockyards Inn's Saddle and Sirloin Club. Please reserve a seat for me at this "Dutch treat" luncheon.

☐ I am a member of the _____ Plant Engineers' Society.

☐ I am not a member of any present plant engineering society but I would like to see one organized in my own city of _____.

Name _____ Title _____

Company _____ Company Address _____

...Retired —after 64 years' service!

RETIRED IS THE WORD for this NYB&P Conveyor Belt! Installed in the "big blizzard" year of 1888, the belt was still in good operating condition when taken out of service in a Minnesota grain elevator late last year. Subsequent laboratory tests recently completed on a section of the belt indicate it might have continued to perform satisfactorily for many more years.

Specifically, these tests revealed that the belt's ultimate elongation was still well below the allowable maximum for new belts. Tested for bucket bolt pull-out, this 64-year-old belt exhibited 85% of the resistance of a new belt of equivalent weight and construction.

Few, indeed, were the manufacturers of industrial rubber products back in 1888. New York Belting and Packing Company, however, had been established in this field for *more than 40 years* when it produced this notable example of NYB&P quality and durability.

Today's NYB&P conveyor and power transmission belting, industrial hose and packings—incorporating today's newest fibers and rubber compounds—may be expected to set even more impressive records in the future. Meanwhile, they are available for your use *now* . . . through your local NYB&P Distributor. His extensive stocks and application experience are at your service.

Gilmer **V-BELTS and "TIMING"® BELT DRIVES**

NYB&P INDUSTRIAL RUBBER GOODS

NYB&P — Founded 1846 — NEW YORK BELTING & PACKING CO.

NEW YORK BELTING & PACKING CO. 1 Market St., Passaic, N. J.

America's Oldest Manufacturer of Industrial Rubber Products

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OIC Valves

...THE MODERN LONG LINE

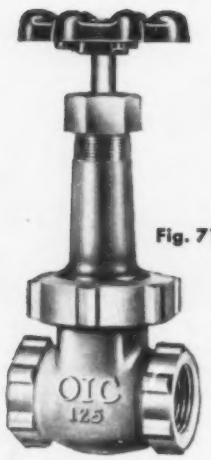

Fig. 7100

Fig. 520

BRONZE

⅛" to 3". 125, 150, 200, 300 and 350 WSP; 300A; 200, 400, 2,000 and 2,500 WOG.

Fig. 516

Fig. 333

Fig. 1140

IRON

1¼" to 16". 125, 150 and 250 WSP; 175, 200, 400 and 500 WOG. ¼" to 4" DUO-BOLT Gates.

Fig. 124

CAST STEEL

2" to 16". 150, 300 and 600 lb. primary pressure series.

Fig. 6033

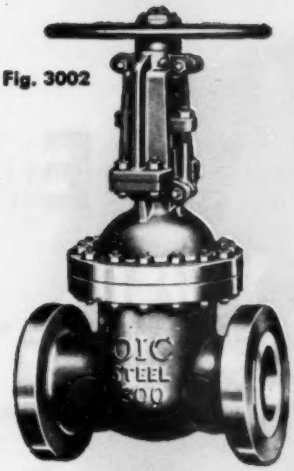

Fig. 3002

Fig. 1572

FORGED STEEL

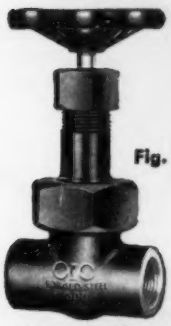

Fig. 1021

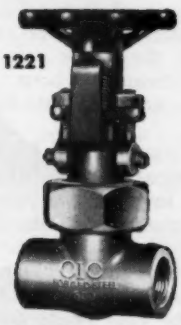

Fig. 1221

¼" to 2" Gate, Globe, Angle, Check Valves; 600 lb. primary pressure series.

STAINLESS STEEL

Fig. 810

½" to 2". Gate valves, 200 lb. primary pressure series.

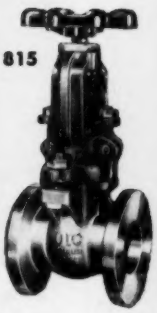

Fig. 815

LUBRICATED PLUG

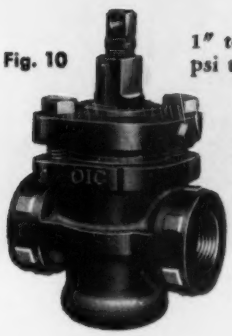

Fig. 10

1" to 24". Iron . . . 175 psi to 800 psi working pressures. Cast Steel series 150 lb.-230 psi, 300 lb.-600 psi and ASA 150 lb. class.

Contact your authorized OIC Distributor

OIC
FOUNDED 1883

Write for the OIC Catalog Digest for quick valve selection.

THE OHIO INJECTOR COMPANY

WADSWORTH, OHIO

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V E Boiler

YOUR

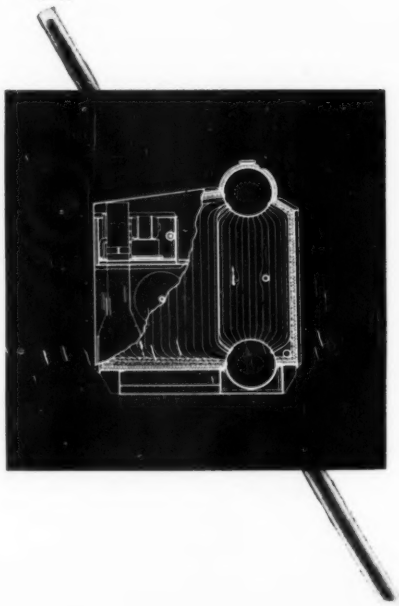
These four C-E Boilers have been specifically designed to meet the requirements of a wide variety of plants. Collectively, they offer you a range of capacities from 4,000 to 350,000 pounds of steam per hour... pressures up to 1375 psi... temperatures to 960 F... arrangements for any fuel or method of firing.

Two of these units, the VP and the VU-10, are fully standardized. [illegible] of the other two has been standardized as far as is practical for its particular field of application. Thus, all four units reflect in purchase price minimum engineering costs made possible by maximum design standardization.

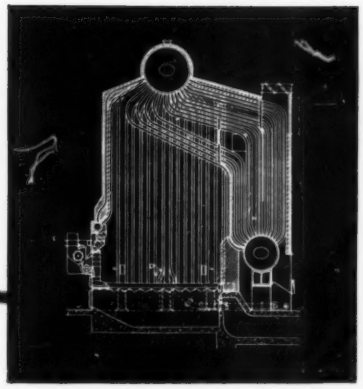
It's small wonder, then, that industries of all kinds have demonstrated widespread acceptance of C-E Industrial Boilers. The low steam costs and top reliability of these Combustion Boilers can be your guide, too, to the maximum return on your new boiler investment.

B-703

C-E Package Boiler — Type VP The VP Boiler is designed to meet the demand for compact, standardized units in the medium pressure range. It is shipped completely shop-assembled, with firing equipment, fittings, and forced-draft fan. It is enclosed in a reinforced, welded steel, gas-tight casing. Arranged for pressure firing of oil or gas, the VP will burn either fuel exclusively or alternately. Designed for shipment by rail or truck, its width and height remain constant... variations are made in length only. Furnace is fully water-cooled, including burner wall, except in three smallest sizes. Large lower drum permits simple, symmetrical tube arrangement and greater water storage capacity.

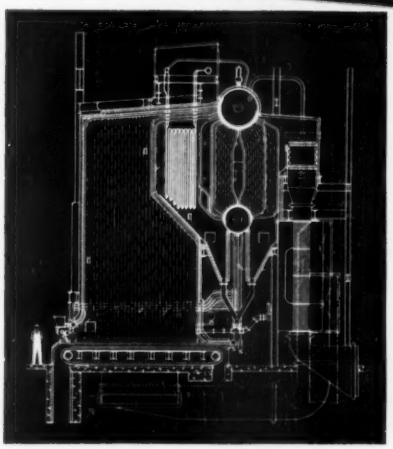


Type VP Boiler — from 4,000 to 30,000 lb steam per hr... pressure to 250 psi... available for either gas or oil firing... fully shop-assembled.



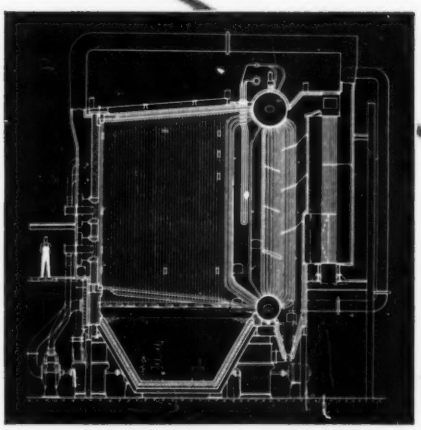
C-E Vertical-Unit Boiler — Type VU-10 Like the Type VP Package Boiler, the VU-10 is designed for plants having a limited number of operating and maintenance personnel. It is designed for industrial load conditions and will operate efficiently over a wide range of output. The boiler is bottom supported and has no outside supporting steel. The same general cross-section arrangement of drums, boiler convection bank, and furnace wall cooling is used when firing oil, gas or coal. Coal firing may be with underfeed, spreader, or chain grate stokers.

Type VU-10 Boiler — From 10,000 to 60,000 lb steam per hr . . . pressure to 475 psi . . . superheat to 200 F . . . suitable for any type of fuel.



C-E Vertical-Unit Boiler — Type VU-40 The VU-40 Boiler is a baffleless boiler designed for use with fuels having abrasive qualities in the flue dust. In a baffled boiler using these abrasive fuels, erosion is apt to occur. In the VU-40 Type Boiler, the eroding action of abrasives against boiler tubes and refractory is virtually eliminated. Like the VU-10 and VU-50, this unit is of symmetrical design, providing uniform gas flow and heat absorption across the full width of the boiler.

Type VU-40 Boiler — from 60,000 lb steam per hr up . . . pressure to 1375 psi . . . temperature to 960 F . . . for use with abrasive or high ash content fuel . . . indoor or outdoor type construction.



C-E Vertical-Unit Boiler — Type VU-50 With the VU-50 Boiler, the average plant can achieve standards of performance closely approaching those of large central power stations. The basic design was originated by Combustion in 1925 and has been widely accepted among steam-power engineers everywhere. Because of its symmetrical design the VU-50 provides uniformity of gas flow, water level and steam release across the full width of the unit. It may be fired by pulverized coal as shown opposite or by any other fuel or method of firing. Heat recovery equipment may be added.

Type VU-50 Boiler — from 60,000 to 350,000 lb steam per hr . . . pressure to 1375 psi . . . temperature to 960 F . . . for any fuel or method of firing . . . indoor or outdoor type construction.

COMBUSTION ENGINEERING, INC.

Combustion Engineering Building • 200 Madison Ave., New York 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

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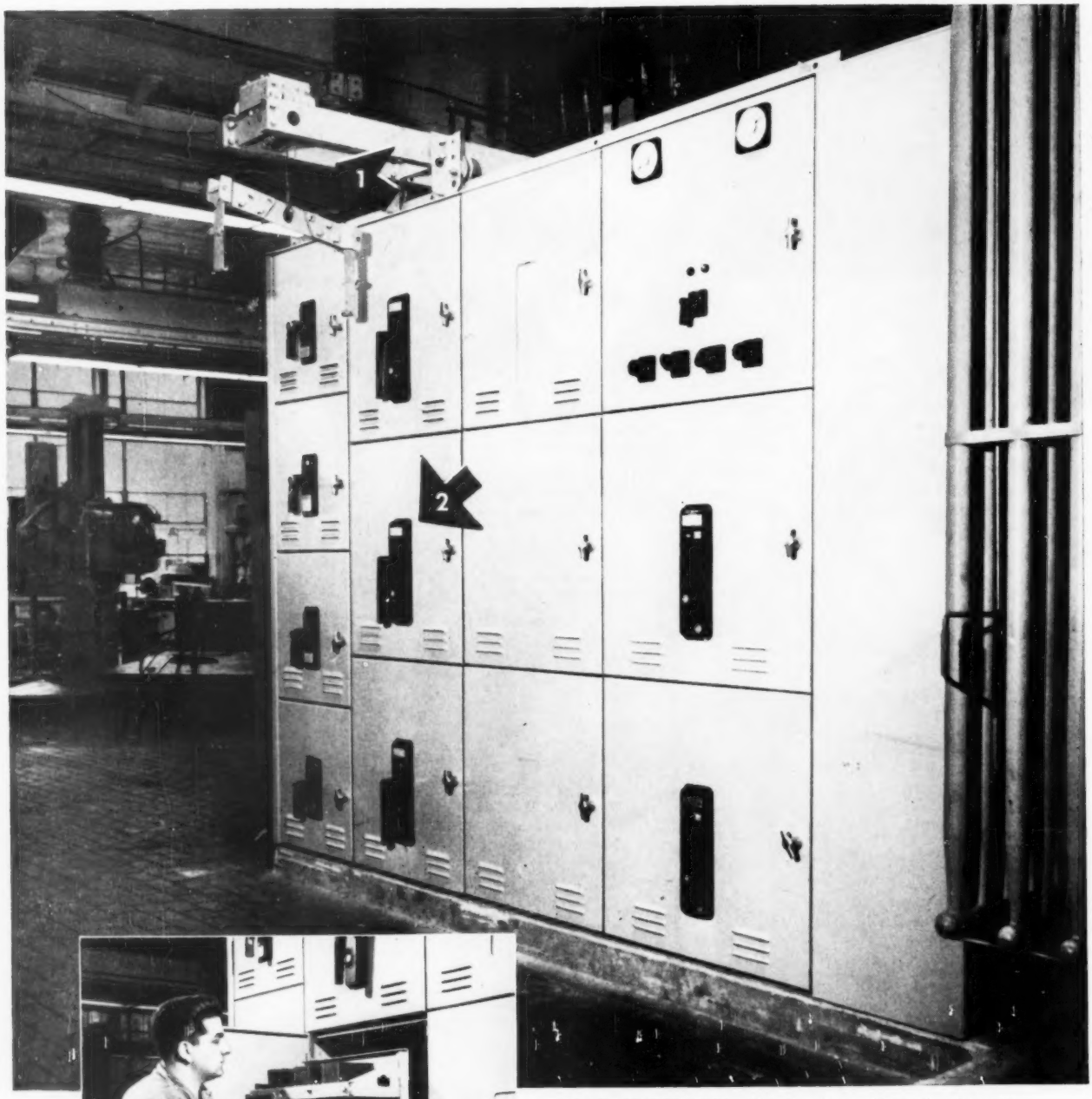
New AK breaker equipment



LOAD CENTER UNIT (above) shows General Electric's new AK line of equipment installed in load area in industrial plant. Compact, neat in appearance, breaker and switchgear compartments form a completely co-ordinated unit. Breaker handling device (1) easily raises or lowers breakers into position. AK-1-50 breaker, shown here (2) in closed compartment is easily racked out by racking mechanism (3), shown at left, for inspection or maintenance.

gives *easier* breaker handling

Switchgear units are standardized—fully co-ordinated—tested to 100,000 amps.

General Electric's new indoor and outdoor drawout equipments with a complete line of Type AK air circuit breakers marks the first major improvement in low-voltage drawout switchgear design in the past 20 years.

Completely co-ordinated compartments and breakers make the new design smaller and more compact. Standardized compartments provide greater flexibility, permit faster delivery schedules and less maintenance.

Structure frame, bus supports, bus and connections of the new equipment have been designed and tested to withstand up to 100,000 amps short-circuit current. Isolation of both control wiring and terminal blocks within steel troughs also means greater reliability and safety than ever before.

A simplified, sturdy racking mechanism with positive interlocks on the breaker frame permits easy inspection of the breaker and mechanism.

All units are designed with provisions for a new breaker-handling device to raise or lower the breaker easily to or from any compartment. The lifting device may be left in position without interfering with operation of the switchgear.

Type AK breakers are available in all ratings from 25 to 4000 amps, continuous current and 15,000 to 100,000 amps interrupting ratings, with 30-cycle momentary ratings equal to full interrupting ratings.

Outstanding design features of the new AK breakers are highlighted by three G-E exclusives—

Stored-energy closing mechanism—for safer, surer closing even though control power is lost during closing operation—a G-E exclusive.

Selective operation—up to full interrupting rating—another G-E exclusive.

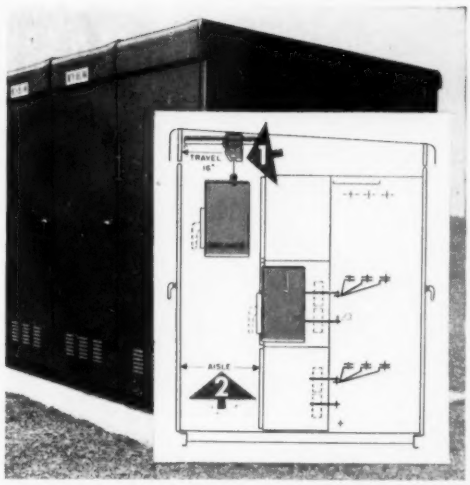
Interchangeable parts—on new breakers cut down your parts stocking problem and simplify maintenance.

Racking mechanism—is part of breaker and permits inspection outside compartment away from live parts.

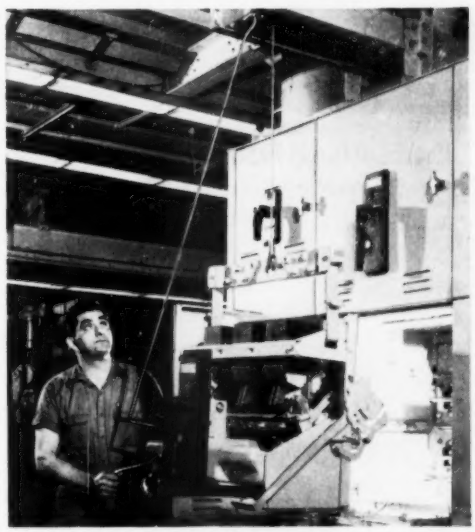
New equipments—designed and tested to withstand up to 100,000 amps. Design improvements give you many new features and benefits.

New breaker-handling device—is designed as integral part of units. Optional for both indoor and outdoor equipments.

For details on the new AK breaker—and new low-voltage drawout switchgear equipments—ask your G-E Apparatus sales representative for Bulletins GEA-5915 and GEA-5916, or write to General Electric Company, Schenectady 5, N. Y. 873-5



OUTDOOR EQUIPMENTS have built-in breaker lifting device (1) weatherproof "walk-through" aisle (2), access to either front or rear by weatherproof doors. Rubber gaskets at door, metallic filters over ventilation openings keep out dust, bad weather.



NEW BREAKER-HANDLING DEVICE, in action, can easily raise or lower G.E.'s compact new air circuit breaker. The new lifting device is optional on both indoor and outdoor equipments. It has a front-to-back travel to load a breaker on a truck.

You can put your confidence in—

GENERAL ELECTRIC

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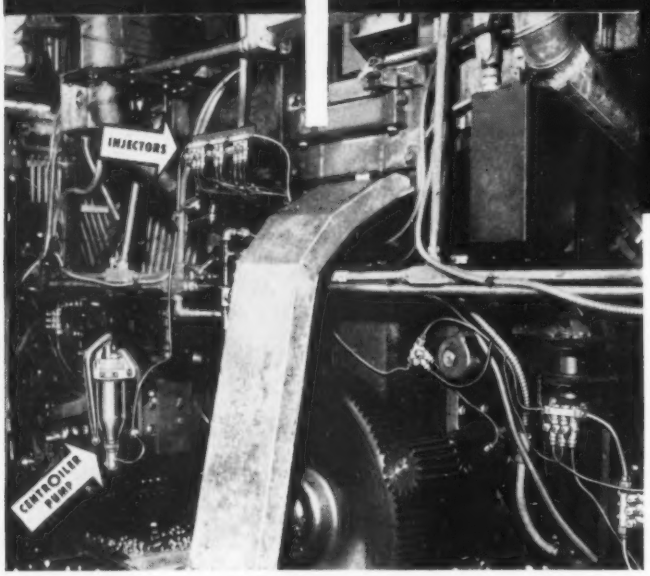
ELIMINATED WEEKLY BEARING BURNOUTS... ENDED COSTLY HAND OILING...

Lincoln



International Seal and Lock Company likes the results so well that additional CentrOilers are being installed as fast as they can get around to it. *You can share* in savings like these with a Lincoln Centralized Lubricant Application System to assure application of . . .

THE RIGHT LUBRICANT
IN THE RIGHT QUANTITY
AT THE RIGHT TIME...
Automatically!

One of the nation's leading manufacturers of metal seals for freight car and truck doors reports this experience:

"Prior to the installation of our Lincoln CentrOiler* system, it took one man half a day each week to hand oil our machine. The labor cost was approximately $540 per year. Even with this care, we had regular bearing burnouts once or twice each week.

"Since our Lincoln system was installed last year, we have eliminated both the bearing burnouts and the labor expense of hand oiling."

*Tradename Registered

Write today for your **FREE** copy of Catalog 80, illustrating and describing Lincoln's complete range of 22 Centralized Systems. Our experienced Lubrication Engineers will be glad to work with you in recommending the best System for your needs.

LINCOLN ENGINEERING COMPANY
5702-26 Natural Bridge Ave.
St. Louis 20, Missouri

Lincoln the most trustworthy name in lubricating equipment

DISTRIBUTED NATIONALLY THROUGH LEADING INDUSTRIAL DISTRIBUTORS LOCATED IN PRINCIPAL CITIES

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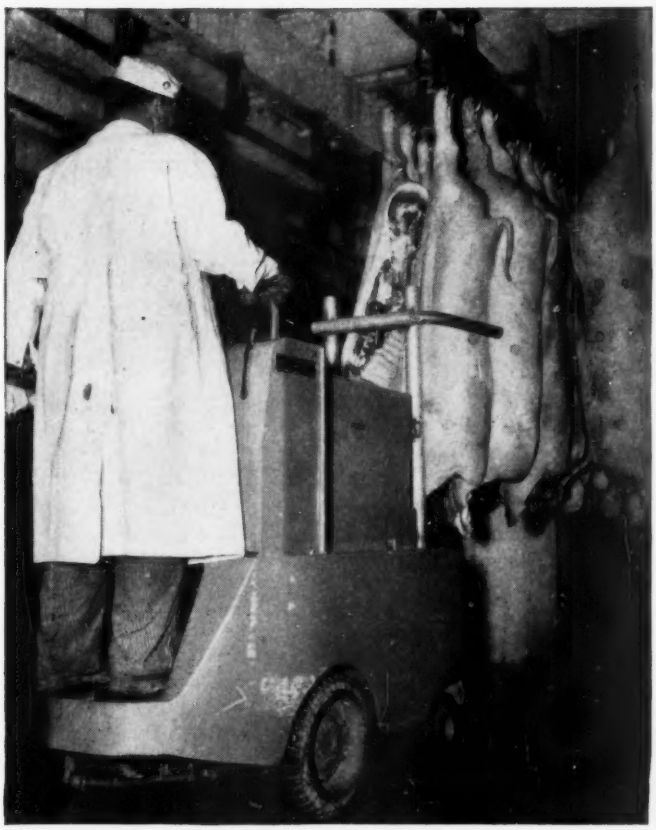
B.F.Goodrich

FREE TW TIRE AND WHEEL ANALYSIS can save you as much as 50% on industrial tires



OILY FLOORS IN YOUR PLANT? Industrial tires go to pieces in a hurry unless you use an oil-proof compound in your tires. Ask the BFG man for recommendations.

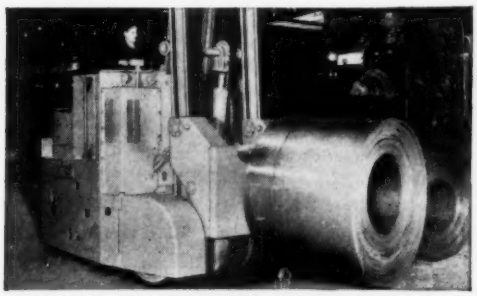
ROUGH HAULING SURFACES? They can slash tire life, increase maintenance costs and foul up work schedules. The BFG man can show you how to get maximum tire life.

FRAGILE LOADS? Materials handling costs skyrocket when fragile materials break. Maybe your handling methods, equipment or tires are to blame. A Tire & Wheel Analysis can help you.

Here's how to start cost cutting

Mail the coupon below for free information on the B. F. Goodrich Tire and Wheel Analysis Plan. Without obligation you can have a trained BFG man study your operations, analyze equipment, loads, hauling surfaces and handling methods. He will tell you what type and size tires, what tread design and compound will serve you best. Because BFG makes a *complete* line of industrial tires, you get impartial recommendations, plus maintenance suggestions that alone may save you hundreds of dollars. Mail the coupon today! A special TW Analysis Plan is available for manufacturers of materials handling equipment.

OUTDOOR OPERATIONS? Tire problems are different from those of inside hauling. The BFG man will show you how to pick the right type tire.



HEAVY LOADS AND EQUIPMENT? Overloads can cause industrial tires to fail prematurely. Your B. F. Goodrich man knows how to match the tire and the load.

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

WRITE FOR THIS BOOK

The B. F. Goodrich Company
Tire & Equipment Division
Department TW- 348
Akron 18, Ohio

Please send me:

☐ *Additional information* on your new Tire and Wheel Analysis Plan

☐ A free copy of your "Industrial Tire Guidebook"

Name_____

Company_____

Street_____

City_____ Zone____ State____

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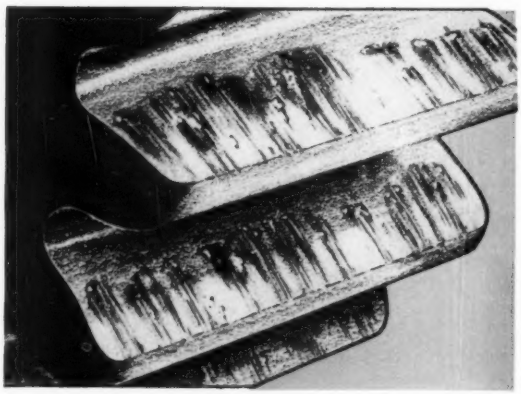
switch to

GULF E.P. LUBRICANTS

and get the benefit

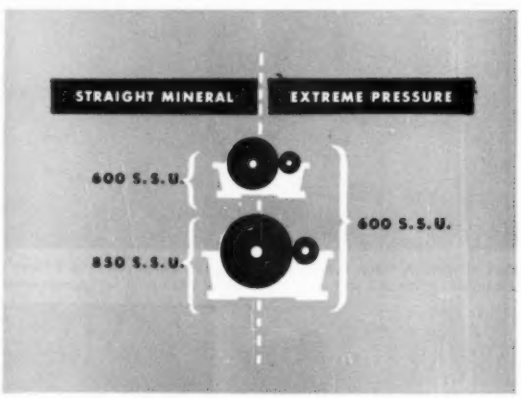
1 **More effective protection against tooth scoring and welding**

Gulf E. P. Lubricants have proven ability to protect gear teeth against damage by scoring and welding. They are specially compounded to provide extra film strength and to prevent metal-to-metal contact under most conditions of overload and shock load. That's why you can usually avoid tooth damage like that shown at the right when you use Gulf E. P. Lubricants. And that's why they provide an extra margin of protection when production demands approach or exceed the rated capacity of the equipment.



2 **Fewer lubricant grades needed— lubricant storage and handling simplified**

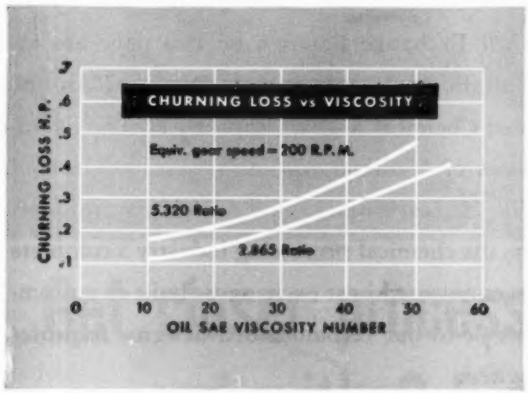
Because Gulf E. P. Lubricants have superior film strength, it is often feasible to use a lower viscosity grade than would be possible with a straight mineral oil. This is a practical advantage for plants operating several different types of gear drives. If, as pictured at the right, two straight mineral oils of different viscosity are specified, one grade of Gulf E. P. Lubricant may well do the job of both. Thus lubricant storage and handling is simplified, and there is less chance for confusion in the oil house.



Gulf E. P. Lubricants are available in the proper viscosity for every gear requirement, ranging from 55 to 1000 SUV at 210 deg. F. For specific recommendations for your equipment, call in a Gulf Sales Engineer. Write, wire, or phone your nearest Gulf office, or send the coupon.

for enclosed gear drives

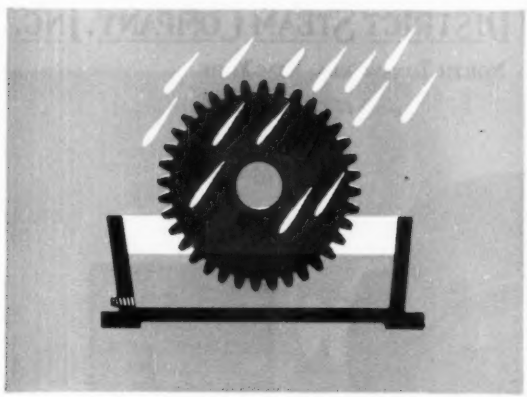
of these practical advantages:



3 Reduced power loss caused by churning in splash-lubricated units — lower power costs

There is another advantage in using a lower viscosity oil in splash-lubricated units where power loss due to churning is appreciable. Since this loss is almost directly related to oil viscosity, the use of lighter Gulf E. P. Lubricants often means reduced heat generation and lower power costs.

The chart at the left shows the effect of viscosity on the churning loss in horsepower of a typical gear unit.



4 Excellent protection against rust

The ability to protect polished gear teeth and antifriction bearings against rust is an important property of a gear lubricant, and is essential in a lubricant for units which are occasionally idle.

Gulf E. P. Lubricants have highly effective rust preventive properties—insure against excessive wear and enlarged tolerances which might result from the presence of abrasive rust particles.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION • GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pa.

Gentlemen:
I would like further information on Gulf E.P. Lubricants: PE

- ☐ Please have a Gulf Sales Engineer call.
- ☐ Please send me a copy of your pamphlet "Gulf E.P. Lubricants for Reduction Gear Drives."
- ☐ Please arrange to show a group in our plant the new Gulf Color Slide Film, "Gears and Their Lubrication," Part I.

Name _____

Company _____

Title _____

Address _____

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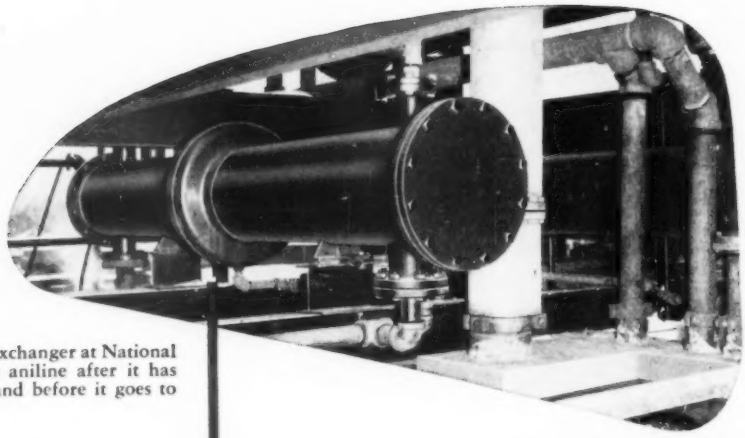


• ADSCO Heat Exchanger at National Aniline sub-cools aniline after it has been condensed and before it goes to storage.

WHERE A HEAT EXCHANGER MUST BE GOOD

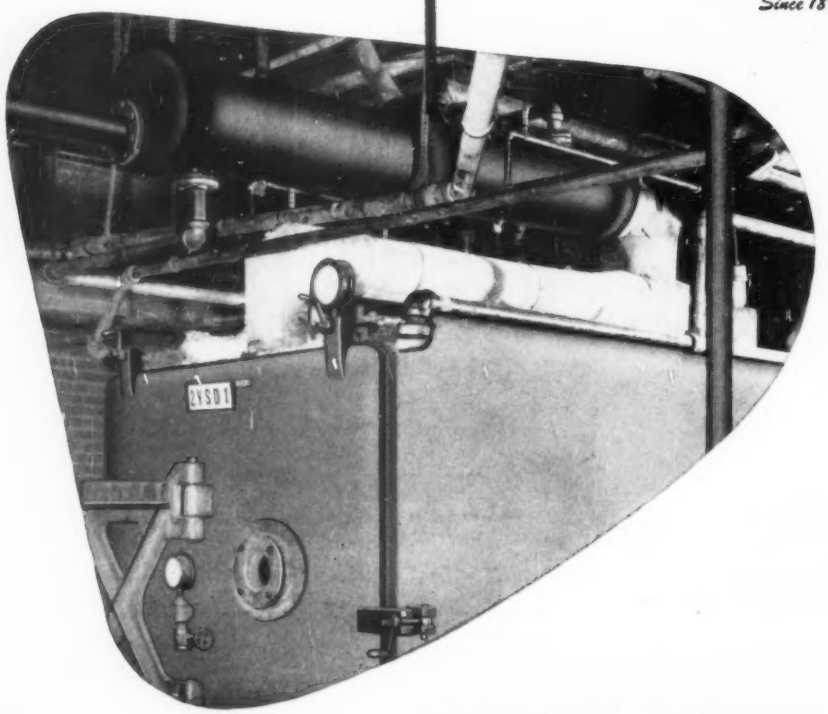
• ADSCO Heat Exchanger (insulated) above vacuum drier at National Aniline condenses organic acid vapor in tubes with water or brine in shell. Exchanger equipped with shell expansion joint.

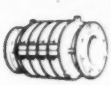
The ADSCO Heat Exchangers shown on this page are installed in the Buffalo, N. Y., plant of the National Aniline Division of Allied Chemical & Dye Corporation. The manufacturing processes of National Aniline require engineered equipment of the highest caliber. . . . ADSCO, in business since 1877, offers the chemical processing industry a complete line of carefully-engineered heat exchangers built to customers' specifications or to our recommended designs. Inquiries are cordially invited.

AMERICAN DISTRICT STEAM COMPANY, INC.

NORTH TONAWANDA, NEW YORK

Since 1877





EXPANSION JOINTS

TRAPS

STRAINERS

SEPARATORS

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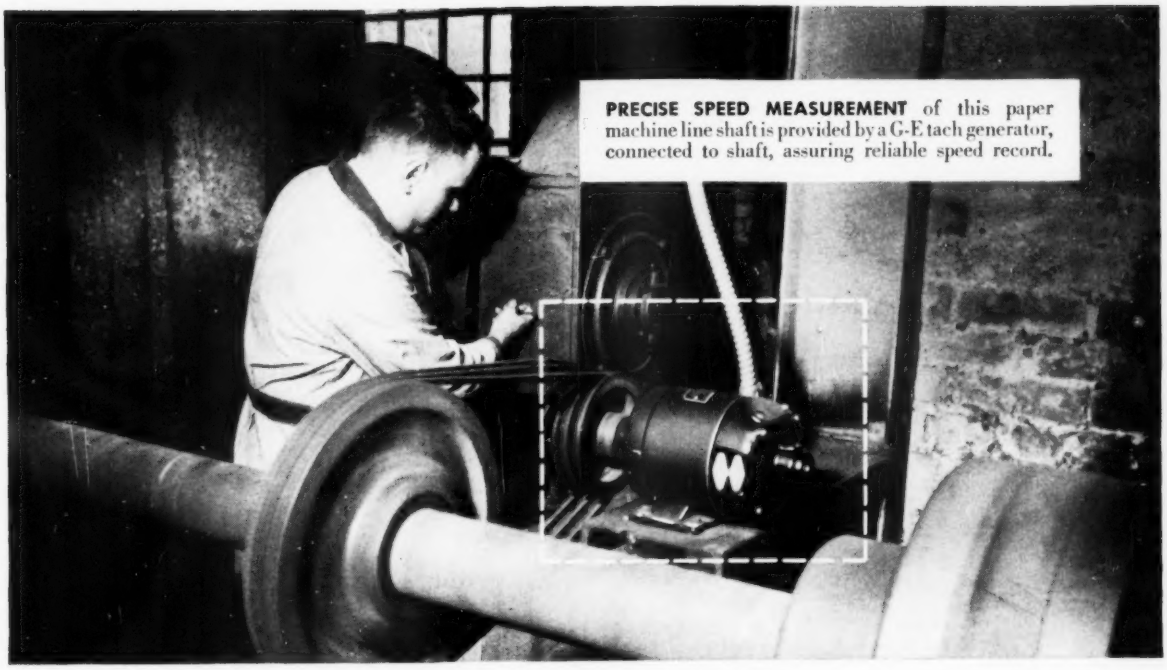
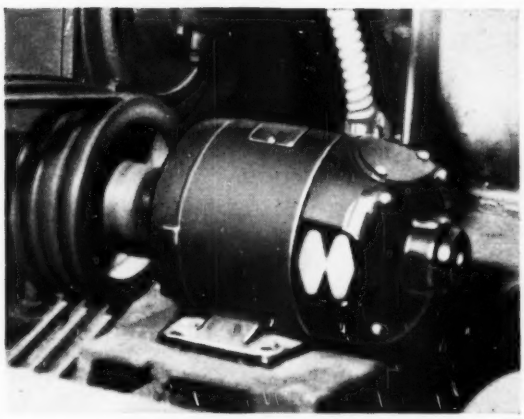


PRECISE SPEED MEASUREMENT of this paper machine line shaft is provided by a G-E tach generator, connected to shaft, assuring reliable speed record.

Get closer process control by measuring speed with G-E tachometer generator



G-E TACHOMETER GENERATOR connected to an indicating or recording instrument provides one of many accurate control systems obtainable with G-E d-c products.

A precise speed measuring method—using G-E tachometer generators—is one of the many advantages you get from General Electric d-c motors. The tach generator (shown at left) can be located as far as several thousand feet from a recording or indicating instrument. They indicate rotational speeds from 1 to 15,000 rpm . . . permit immediate manual speed adjustment.

BECAUSE ONLY D-C MOTORS can be controlled over a wide range of characteristics like speed, torque, voltage, etc., more and more G-E d-c products are being used to assure maximum utilization of expensive modern machinery. You can get efficient, more automatic, modern production with G-E d-c products such as the tachometer generator above, d-c motors, motor generator sets, amplidynes, and thy-mo-trol* motors.

USE D-C MOTORS for maximum efficiency, and remember that General Electric's Application and Sales Engineers can help you select the right d-c motor for the job to be done.

For more information see your local G-E Apparatus Sales Office or Authorized G-E Distributor. General Electric Company, Schenectady 5, N. Y. 704-11

*Reg. Trade-mark of General Electric Co.

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GENERAL ELECTRIC

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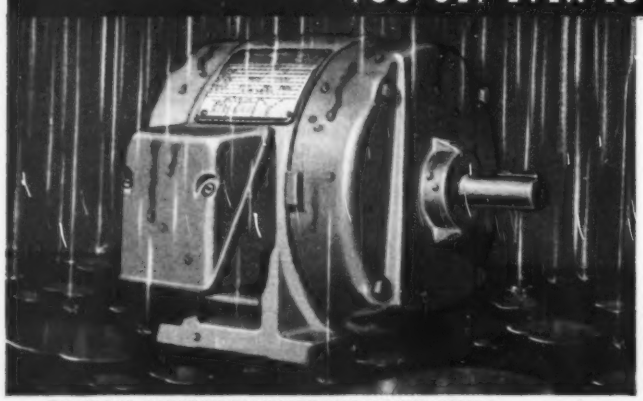
YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.

EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

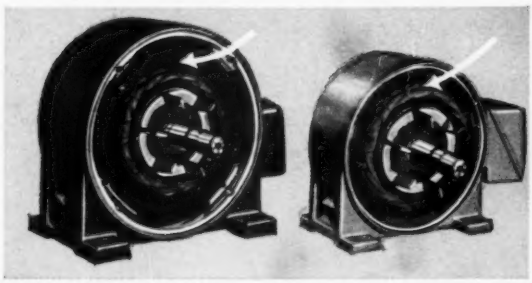
*REG. U.S. PAT. OFF.

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

REG. U.S. PAT. OFF.



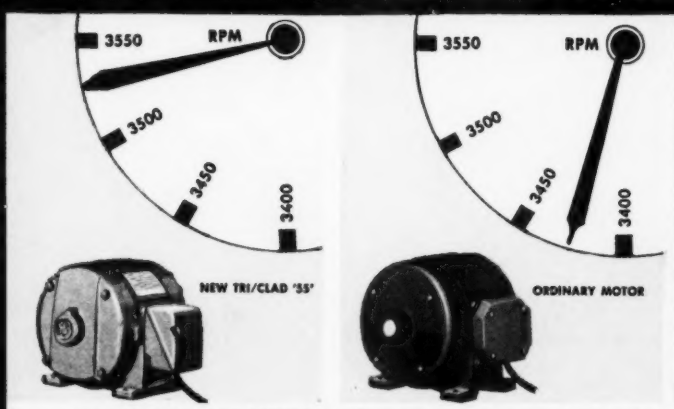
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

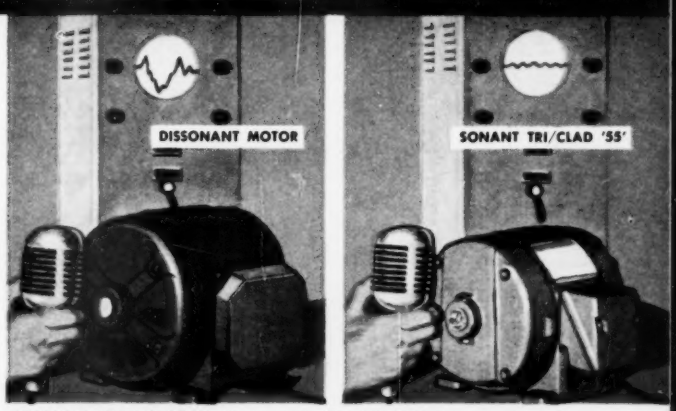
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

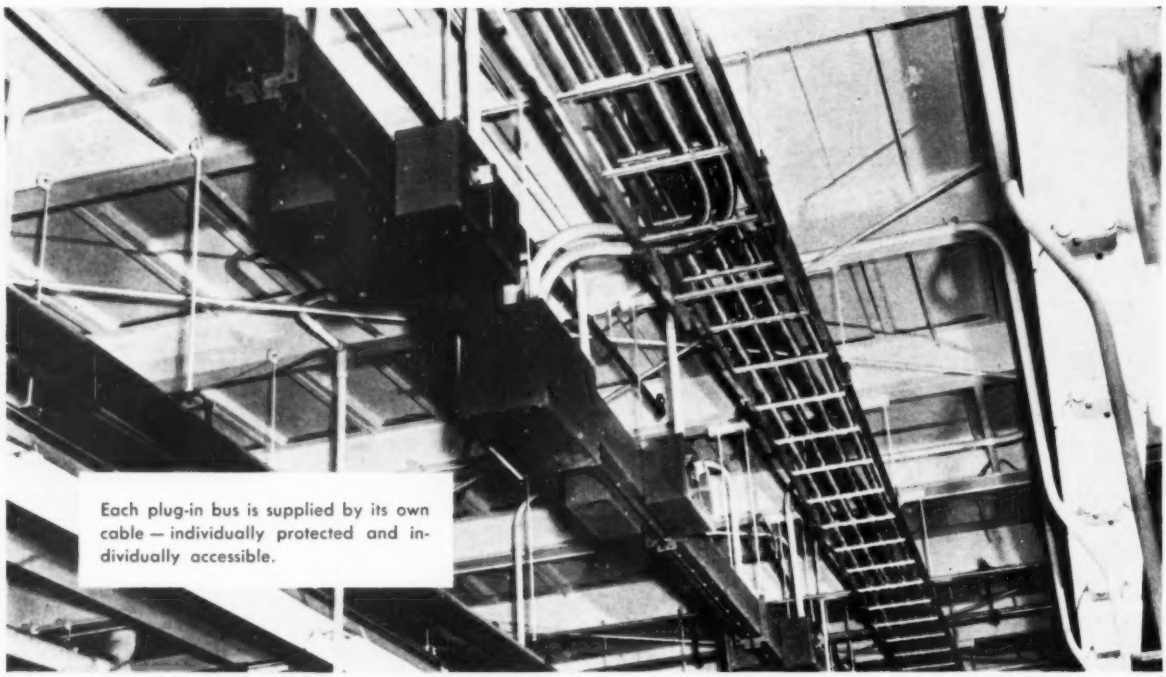
YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS

NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.

EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

Progress is our most important product

GENERAL ELECTRIC



Each plug-in bus is supplied by its own cable — individually protected and individually accessible.

General Electric V-c interlocked armor cable feeder system used to supply 600-volt power to plug-in bus in Cleveland plant of Industrial Rayon Corporation, because . . .

V-C INTERLOCKED ARMOR CABLE SYSTEM CUTS COSTS, INCREASES CIRCUIT RELIABILITY

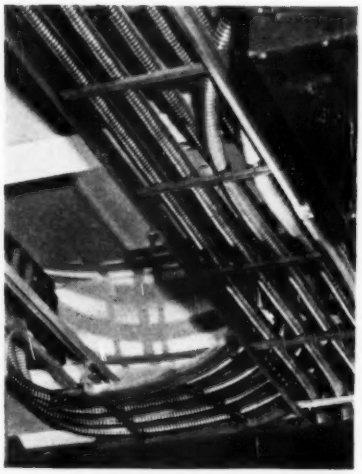
INSTALLED COST SAVINGS

Many industrial concerns are taking advantage of the economies of a G-E V-c interlocked armor cable system. Industrial Rayon Corp., for instance, found that a G-E cable system was by far the most economical means of secondary distribution. Costs were low because the flexible interlocked armor cable could be installed fast—indoors or outdoors, around corners, over beams, and in long runs. The cable was installed on low-cost aluminum racks hung from the ceiling, and spliced with simple mechanical joints. Both engineering and installation time were cut.

INCREASED RELIABILITY

Circuit reliability is increased because each plug-in bus is fed by its own individually protected cable, and is less apt to be affected by any fault that may occur in another circuit. Also, the aluminum armor and racks are better able to withstand the corrosive conditions in certain parts of the plant.

Whether you're planning a wiring system for a new plant or modernizing an existing system, G-E varnished-cambric interlocked armor cable offers you reliable service with savings in both time and cost. Consult your G-E cable specialist, or write Section W111-164, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



The cable bends easily. Corners and projections present no installation problem.

You can put your confidence in—

GENERAL ELECTRIC

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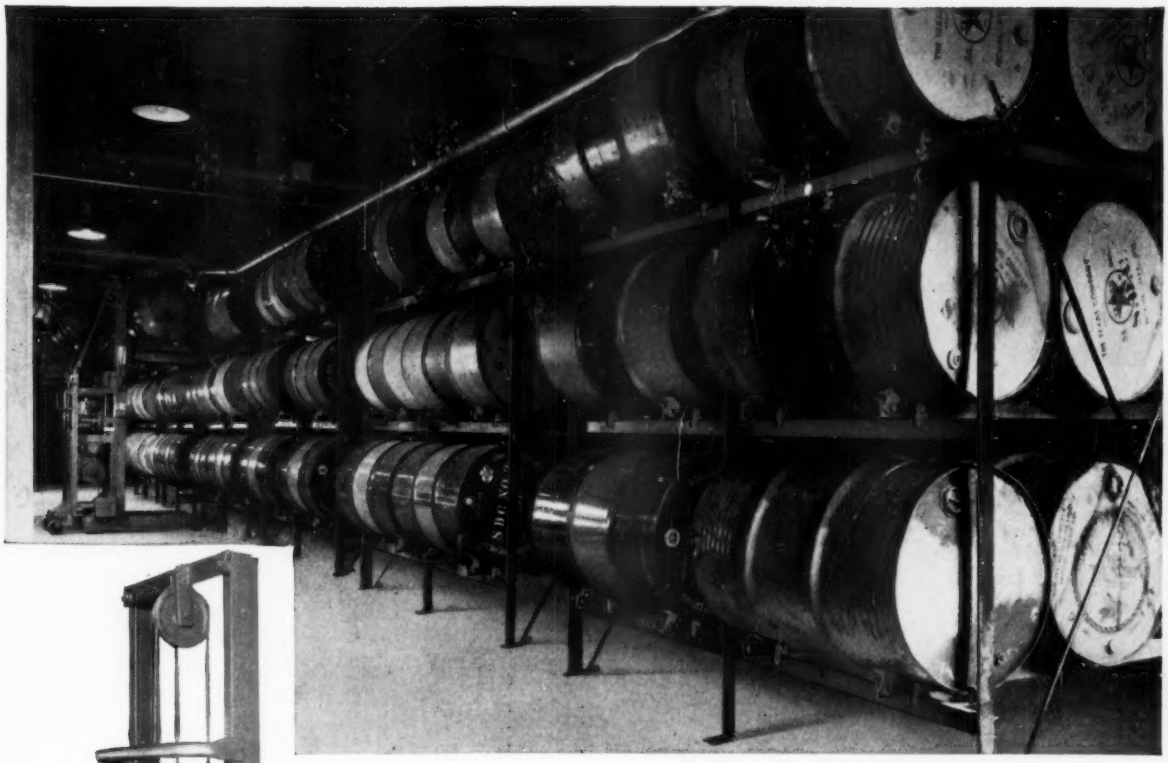

Model "5-Hundred"
Cap. 500 lb. to 2000 lb.

STACK 'EM CEILING HIGH

BARRETT PORTABLE AND STATIONARY ELEVATORS SAVE NEEDED FLOOR SPACE

Use that vacant air space between floor and ceiling . . . it means less required warehouse space . . . less fuel . . . less lighting . . . less labor . . . less maintenance. Let a Barrett Elevator pay you dividends in keeping overhead down.

To meet varied storage requirements, Barrett designed a wide range of elevators from a small hand operated gearless elevator —through junior and senior hand operated types of 500 to 5,000 lb., into electrically operated lifts of ½ to 15 h.p.

The ideal, money-saving combination is a Barrett Elevator (to suit your needs) plus a Barrett Storage Rack System. Illustrated above is a Barrett sectional steel rack for efficient storage of drums or barrels. Other models for open stock, boxes, skids.

An experienced Barrett Engineer will gladly recommend the Barrett combination best suited to your requirements. Call on him for consultation.

BARRETT-CRAVENS COMPANY
4649 S. Western Blvd., Chicago 9, Illinois
Representatives in All Principal Cities
Canadian Licensee: S. A. Armstrong, Ltd., Toronto, Canada

Barrett Handling Equipment

BARRETT

GET THIS NEW CATALOG 535 on the complete line of Barrett material-handling equipment. Your request will bring a copy to your desk promptly.

ONE MAN DOES MORE THAN 3 OR 4...*WITH A BARRETT*

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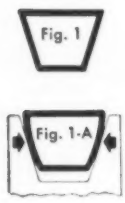
Why V-Belts with CONCAVE SIDES Last Longer!

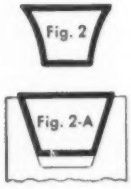
(U.S. PAT. NO. 1813698)

Prove this yourself!



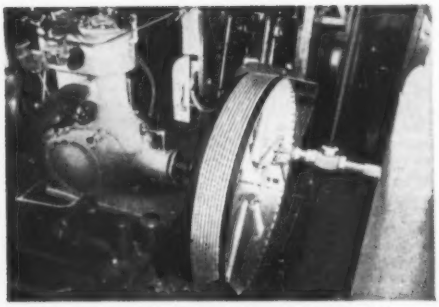
Take any *straight-sided* V-Belt (Fig. 1). Bend it—as it bends in going around a pulley. The sides will at once *bulge out* (Fig. 1-A). Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes *extra wear* at the points shown by the arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)



Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt life and *lower belt costs* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE Sides—the Gates Vulco Rope!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

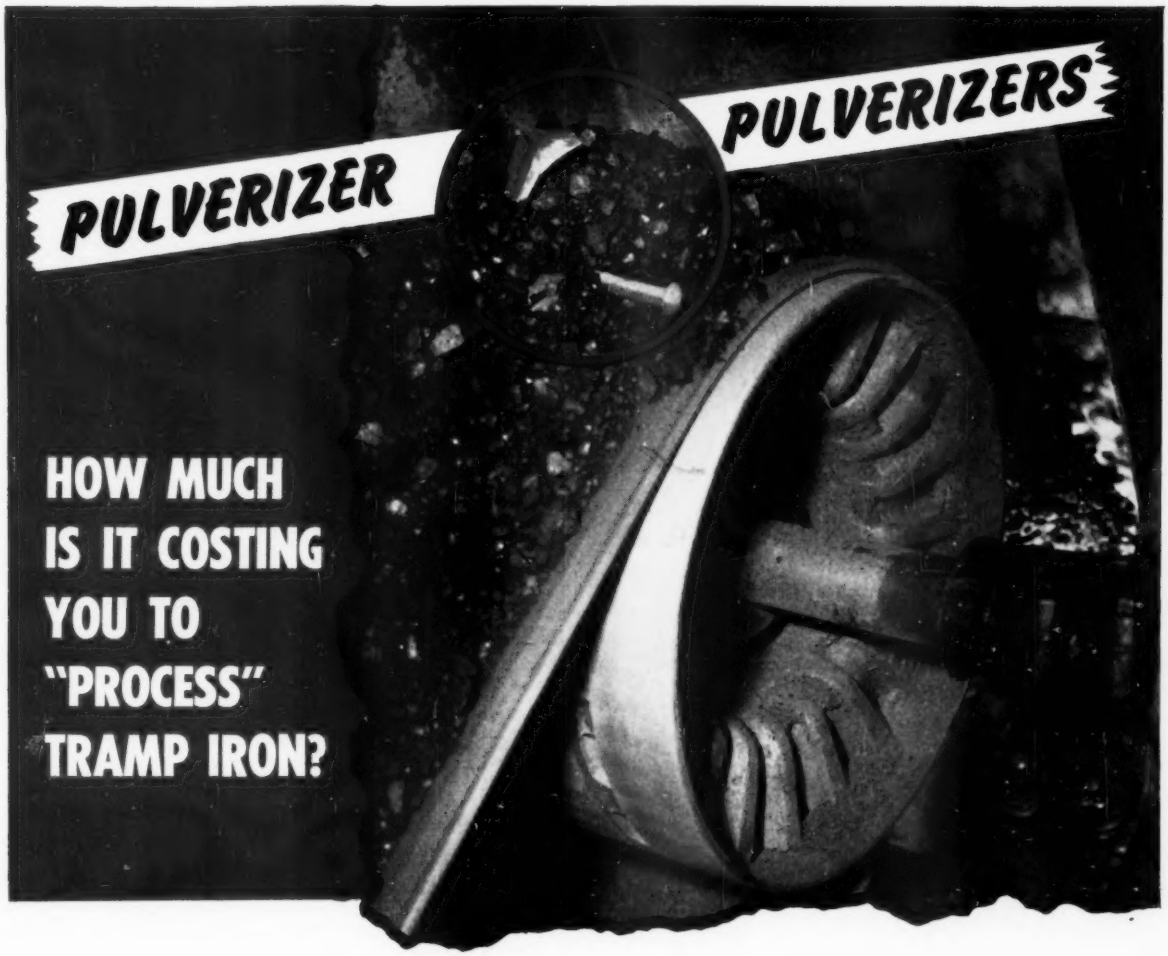
Gates VULCO ROPE DRIVES

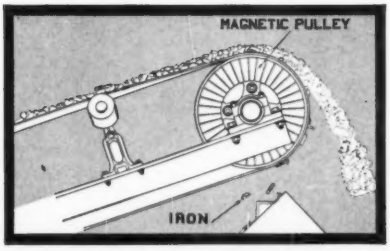
REG U S PAT OFF

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

For more facts circle 517 on Reply Card





THIS IS HOW DINGS MAGNETIC PULLEYS OPERATE

Non-magnetic materials flow off the belt in normal trajectory. Magnetics are held to the belt by magnetic force and discharged separately. A divider is used for cleaner separation.

● IT'S not costing the operators of the power station where this picture was taken an extra cent. Because the head pulley on this conveyor which feeds a coal pulverizer is a Dings Magnetic Pulley. The spike and steel fragment you see in the picture were held firmly to the belt by magnetic force and discharged separately from the coal.

This plant, and a lot of others, learned that feeding tramp iron into coal pulverizers or other processing machinery is too costly . . . that the installation of a Dings Magnetic Separator eliminates a lot of downtime and repairs.

Don't try to process tramp iron. Get rid of it. Dings Catalog C-5000-B describes the most complete line of magnetic separators for the purpose. You'll find it profitable reading. A request on your letterhead will bring you a copy by return mail. And if your tramp iron problem is pressing, there are Dings representatives in all principal cities.

Dings

DINGS MAGNETIC SEPARATOR COMPANY

4766 W. Electric Avenue • Milwaukee 46, Wisconsin

PPU453

For more facts circle 518 on Reply Card

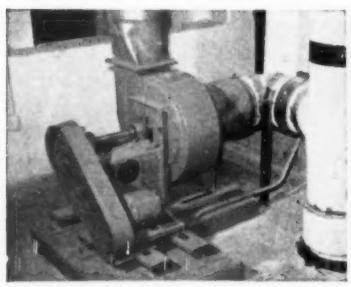
Wyandotte Chemicals Research Bldg. Architect: Stanton & Hillier. Consulting Engineer: George Wagschal Assoc. Contractor: Walbridge-Aldinger Co.

Better Air

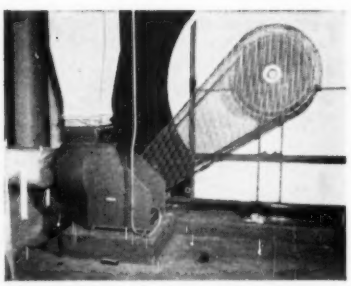
for tomorrow's chemical research

Wyandotte Chemicals Corp. chooses American Blower equipment for new multi-million dollar research building

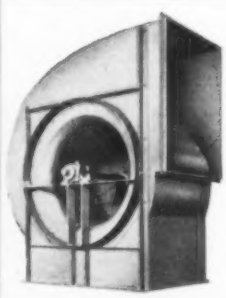
Air — the right kind of air, properly cleaned, conditioned and humidified — is a vital necessity in a modern chemical research laboratory. That's why Wyandotte Chemicals Corp. chose American Blower equipment for their highly functional new research building which has complete air conditioning in every laboratory. American Blower engineers have a complete knowledge of the air cycle and the special problems of many industries. Whenever you have an air handling problem give your nearest American Blower or Canadian Sirocco Branch Office a call.



Individual laboratory exhaust fans (rubber covered and corrosion resistant) have two speeds: slow for normal exhaust; high for experimental work. This allows the chemist to completely control room and hood ventilation.



Secondary air is supplied by an American Blower HS fan with humidifier and dehumidifier, heating and cooling coils. Fan in foreground is American Blower utility set used to ventilate hard-to-reach areas such as stairways, etc.



American Blower Series 81 Sirocco Fan. All Sirocco Fan ratings are certified in accordance with the Standard Test Code.

AMERICAN BLOWER CORP., DETROIT 32, MICH. • CANADIAN SIROCCO CO., LTD., WINDSOR, ONT.
Division of American Radiator & Standard Sanitary Corporation

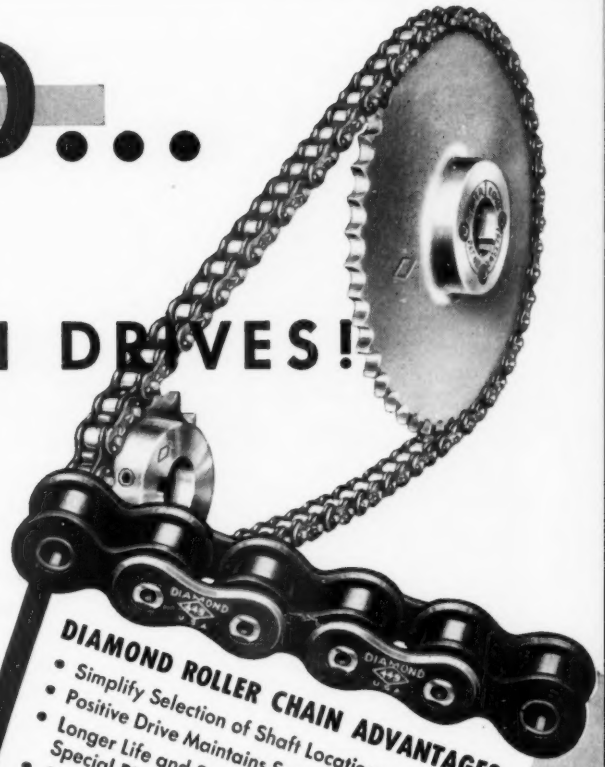
AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

For more facts circle 519 on Reply Card

DIAMOND...

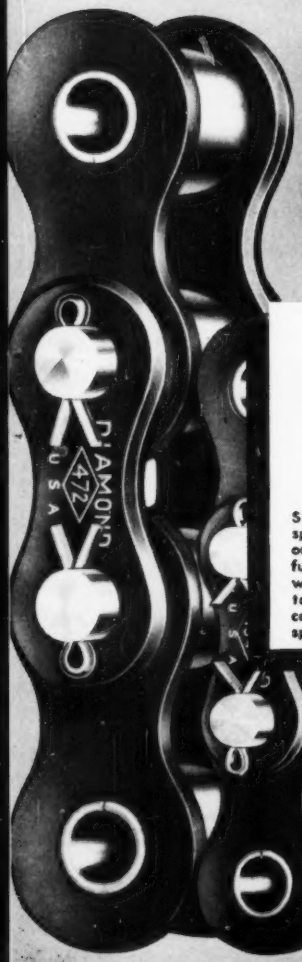
Headquarters for ROLLER CHAIN DRIVES!



- **A complete line of American Standard Roller Chain from 1/4" Pitch #25 through 2 1/2" Pitch #200.**
- **A complete line of Roller Type Conveyor Chain from 1" Pitch through 4" Pitch.**
- **A complete line of Stock Sprockets for American Standard Roller Chain 1/4" Pitch through 2" Pitch to accommodate all popular shaft sizes and provide all desired speed ratios.**
- **A complete line of Flexible Shaft Couplings utilizing double strand roller chain engaging two sprocket halves stocked in all popular bores.**

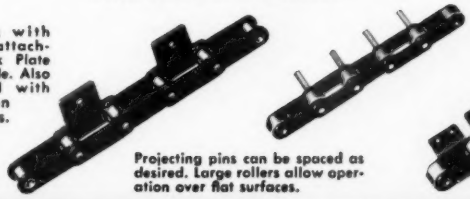
DIAMOND ROLLER CHAIN ADVANTAGES

- Simplify Selection of Shaft Locations
- Positive Drive Maintains Speed Ratios
- Longer Life and Smoother Operation Assured by Special Pitch Hole Preparation
- Shot-Peened Since 1944 to Increase Fatigue Resistance



CONVEYOR CHAINS

Pin Link with straight attachment Link Plate on one side. Also furnished with plates on both sides.



Projecting pins can be spaced as desired. Large rollers allow operation over flat surfaces.

Bent attachment plates are highly adaptable as a fastening base for most any conveying or timing device.

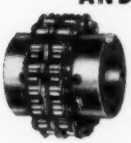
SPROCKETS

Type A Steel plate sprockets without hubs can be furnished plain, with drilled or tapped holes, counterbored or split.

Type B Hub on one side of sprocket only.

Type C Sprocket can be furnished with equal hub projection on each side, or with longer hub projection on one side than on the other.

FLEXIBLE COUPLINGS AND CASINGS



Diamond Couplings are all steel —two sprockets and a length of double strand high strength Diamond Roller Chain. Coupling absorbs shaft end-play and misalignment—is easy to connect or disconnect.

Type A Casing gives protection against abrasive dust and corrosive atmospheres. It provides for excellent lubrication, reduces maintenance and prevents lubrication throw-off.

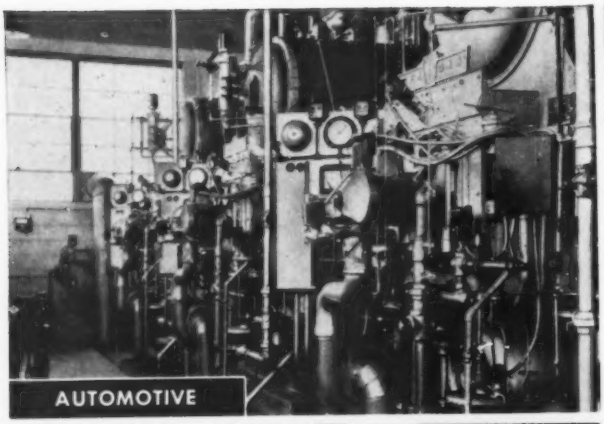
Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

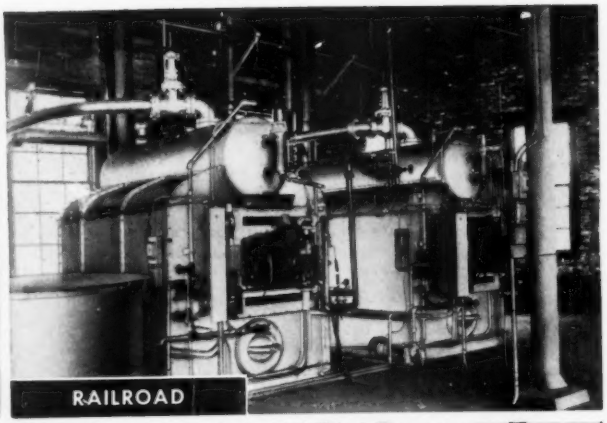
DIAMOND **ROLLER CHAINS**

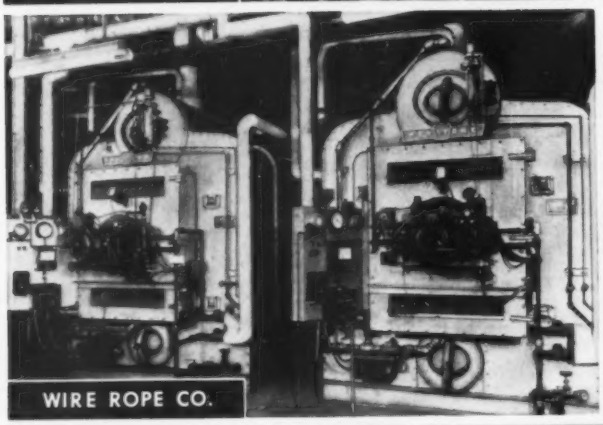
DIAMOND CHAIN COMPANY, INC. *Where High Quality is Tradition*

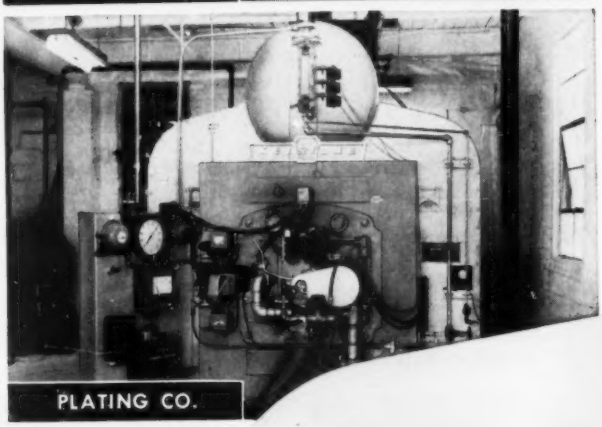
Dept. 614, 402 Kentucky Avenue, Indianapolis, Indiana

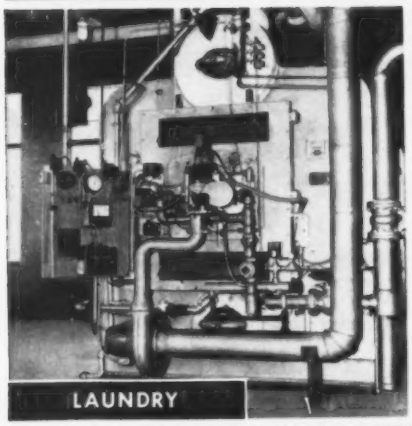
Offices and Distributors in All Principal Cities


AUTOMOTIVE

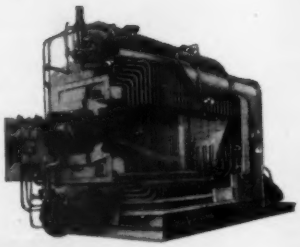

RAILROAD

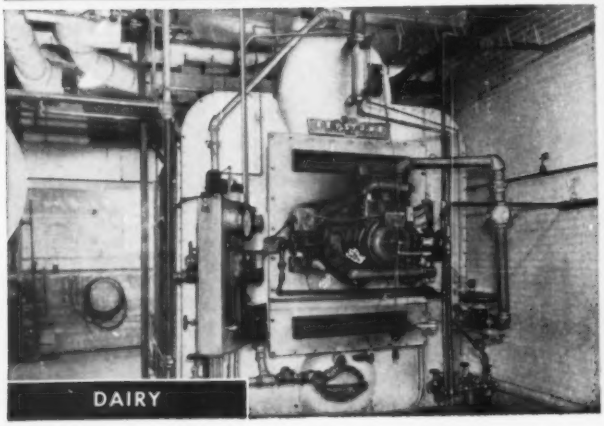

WIRE ROPE CO.

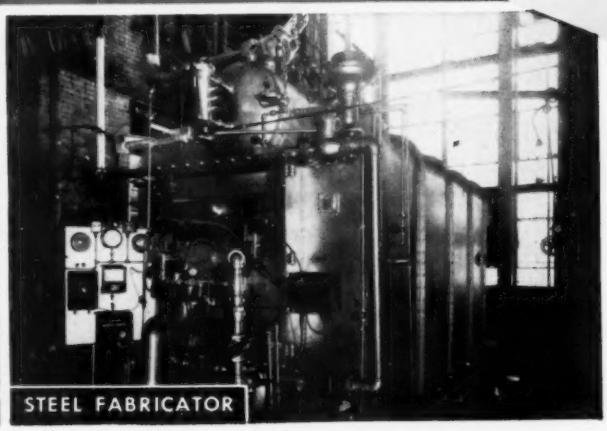

PLATING CO.

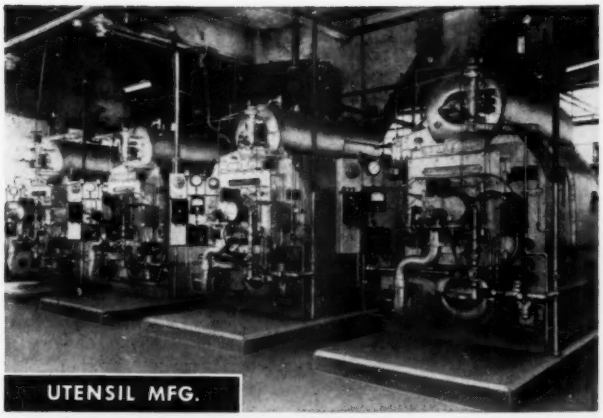

LAUNDRY

You can depend on Erie City for sound engineering ~

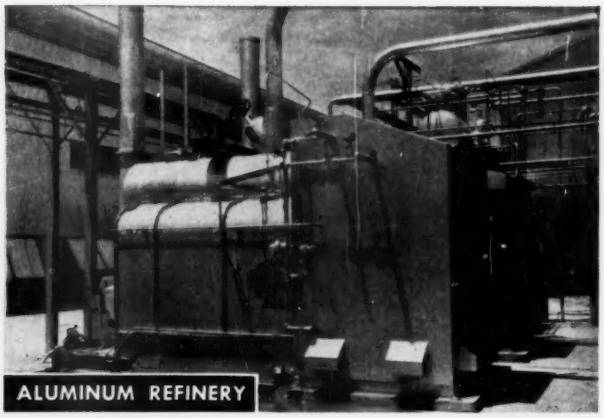



DAIRY


STEEL FABRICATOR



UTENSIL MFG.



ALUMINUM REFINERY

Acceptance

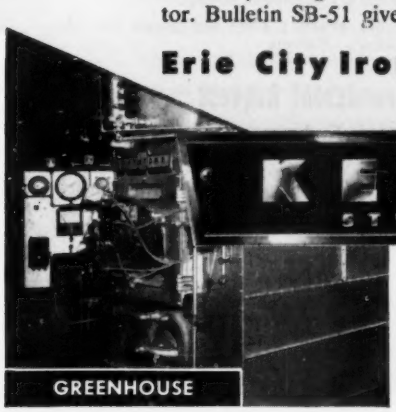
THAT IS EARNED ~

Erie City Iron Works has hundreds of successful Keystone package water tube boiler installations in all types of industry. True acceptance of any product is the result of successful installations, operating under all types of conditions. Acceptance of the Keystone Steam Generator did not just happen . . . it was earned.

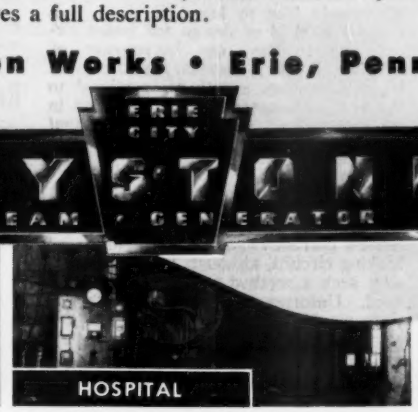
We are proud of our successful installations, operating both indoors and outdoors, with operating pressures ranging from 15 to 600 psi, and producing from 2,500 to 35,000 pounds of steam per hour.

The Keystone is a soundly engineered 2-drum water tube boiler which comes complete with burner, controls and fans all mounted, piped and wired. Add to this the fact that your Keystone is FACTORY FIRE TESTED and you can be assured of a successful and trouble free installation. Every desirable advantage of modern power generation has been incorporated into the Keystone Steam Generator. Bulletin SB-51 gives a full description.

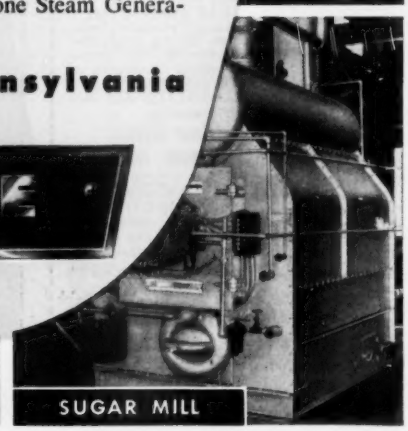
Erie City Iron Works • Erie, Pennsylvania



GREENHOUSE



HOSPITAL



SUGAR MILL

For more facts circle 521 on Reply Card

LIKE AN
ATOMIC
EXPLOSION
JUST ⅛" FAUCET LEAK MUSHROOMS INTO ATOMIC WASTE OF APPROXIMATELY
95,000
GALLONS OF WATER YEARLY!

Cost of wasted water @ $1.90 per M. cu. feet is $24.14.* If the leak is in a hot water faucet then fuel cost for heating this wasted water will be: $88.91 if coal (9,879 lbs.)†; $91.08 if oil (792 gals.)†. $84.41 if gas (84,411 cu. ft.)†. *These figures authenticated by Hackensack Water Co.* and American Gas Association†.*

you can stop this needless waste now with Pat'd
'SEXAUER'
"EASY-TITE"
Faucet Washers

THE ONLY WASHERS BUILT LIKE A TIRE WITH FIBERGLAS RE-ENFORCEMENT.

Fiberglas, with a melting point of 1200°F., is unaffected by destructive heat of modern superheat water systems; has a tensile strength of 460 lbs. per sq. in.; non-absorbent; resists all chemicals.

'SEXAUER' "EASY-TITES" OUTWEAR ORDINARY WASHERS 6 to 1!

... Now available with a greatly improved special du Pont COMPOUND which adds substantially to longer, trouble-free washer service. This COMPOUND keeps washer from going to pieces under extreme hot water, withstands water impurities and has superior tensile strength. That's why 'Sexauer' "Easy-Tites" won't spread, split or "mush-out." Also why 'Sexauer' "Easy-Tites" outlast all other washers by 6 to 1, thus saving labor on 5 REPEAT REPAIRS, plus water and fuel while prolonging life of expensive fixtures.

FREE CATALOG!

For water savings, lower maintenance costs, lower fuel costs, write today for new Edition H. 'Sexauer' "Easy-Tite" washers just one item in over 3,000 TRIPLE WEAR plumbing repair parts and precision tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVERNMENT AGENCIES that rely on 'Sexauer' repair materials.

'SEXAUER' MAINTENANCE ENGINEER AT YOUR SERVICE

There's a 'SEXAUER' TECHNICIAN within quick call from coast-to-coast, who offers a special SURVEY SERVICE that sets up schedule of exact replacement parts for your plumbing fixtures regardless of make or age. *No obligation!*

A postcard will bring him and your NEW catalog promptly

J. A. SEXAUER MFG. CO., INC. Dept. S-14
2503-05 Third Avenue, New York 51

as advertised in THE SATURDAY EVENING POST

SEXAUER
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

For more facts circle 522 on Reply Card

BACKTALK about our past issues

Edited by R. L. Marinello

Pipe Sizing Charts

PLANT ENGINEERING:

"Many times in the past years this office has looked for a very convenient table or chart for sizing steam and condensate piping at various pressures, and now we have found it, thanks to your magazine.

"Would you be so kind as to send three copies of the pipe sizing tables appearing on pages 92 and 93 of the October, 1953 issue, to my attention. We believe that it would be invaluable in our work with low and medium pressure steam systems.

"We wish to express our appreciation to you for publishing these charts and making them available to the engineers." *D. Overland, Ralph D. Thomas and Associates, Inc., Minneapolis, Minnesota.*

Plans to Use Zeprex To Build Dry Cleaning Plant

PLANT ENGINEERING:

"I read PLANT ENGINEERING at all times and have found it very interesting. It contains a lot of valuable information.

"In the near future, I plan on building a new up-to-date dry cleaning plant if things go as I would like them to and my luck holds out.

"So, can you give me some information on that new material called Zeprex. Having a 34 ft span for floor joist and ceiling joist, is it necessary to have supports under the joists which are 40 lb per cu ft? I would also appreciate knowing the value of a beam 34 ft long that will stand up without any bracing underneath it." *Nick Pilulak, Fort Frances, Ontario, Canada.*

▶ Your sketch is being forwarded to the manufacturers of Zeprex, U. S. Plywood Corp., 55 West 44th St., New York 36, N. Y., requesting that they send you complete information.—*Editors.*

More on Dynamic Braking

PLANT ENGINEERING:

"The methods of braking reported by Mr. Gayle in the October issue are of value to us in portions of our operation but on slightly larger motors than the ones specifically described in the article. We would like to know if there is a rational method of design for brake circuits up to, say, one horsepower or whether all that is necessary is to provide braking currents exactly proportional to the five per quarter horsepower given in the illustration." *H. G. Anson, Assistant Plant Engineer, Graystone Concrete Products Co., Seattle, Washington.*

Reply from Mr. Gayle:

"Frankly I do not feel that there is an entirely satisfactory method of determining d-c current requirements for dynamic braking circuits, although I see no reason why such a method could not be developed. Unfortunately, any such calculations would become rather involved due to the large number of variables which must be taken into consideration.

"While you may not be able to sit down and calculate just how much current would be required for a particular braking application, I think you can evaluate whether dynamic braking would be of value for a particular application.

"Let me generalize by saying that I think such braking is economical for motors up to one hp as long as the inertia of the connected load is not high and the frequency of braking is fairly low. In actual practice, if you were to assume that a ¼ hp motor takes 5 amps, a ½ hp motor takes 10 amps and a one hp motor takes 20 amps, you will be close enough.

"I can tell you that approximately 15 amps d-c total, applied through both windings of a typical ¾ hp split phase induction motor will stop it in about two seconds. When the inertia of the connected load is added, this time will be somewhat longer for the same current. If you use a selenium supply as shown in the October article, you can use a rectifier rated at 5 amps as long as the period of application is relatively short. Frequent braking and starting can cause undue motor heating and eventual insulation failure within the motor. The normal run period or off period of the motor should be long enough so that the temperature rise of the motor is held near its rating.

"If the inertia of your load is high or if the application of braking is frequent, the use of mechanical means of braking may prove of benefit.

"Again, if your need for braking is not frequent and your load does not involve high inertia, I recommend the circuits shown in the October article as an economical and satisfactory solution. Incidentally, if you have a number of motors in the same general vicinity that require braking at different intervals, you can get by with one central rectifier supply and affect considerable saving." *Tom M. Gayle, Oak Ridge, Tennessee.*

Selection Guide for A-C Motors

PLANT ENGINEERING:

"We would appreciate receiving tear sheets of the article 'Selection Guide for A-C Motors,' which appeared in the November, 1953, issue on page 89.

"If there is any charge for this reprint, please let us know." *R. C. Juergens, Chief Product Engineer, W. A. Sheaffer Pen Co., Fort Madison, Iowa.*

▶ No charge; they are yours for the asking.—*Editors.*

Roundabout Request

PLANT ENGINEERING:

"We are forwarding a letter to you which was received from W. S. Butler of St. Regis Paper Co. We will appreciate your taking care of his request for a tear sheet of the article 'Plant Engineer's Role in Employee Relations.'

"This article appeared in complete form in the September, 1953 issue of PLANT ENGINEERING, page 115. It appeared in briefed form in the November, 1953 issue of *Chemical Processing.*" *Helen Henning, Chemical Processing, Putnam Publishing Co., Chicago, Illinois.*

(Continued on page 30)

WILL THIS

ORGANIC AGENT ELIMINATE BOILER SCALE AND SLUDGE?

It might.

In water conditioning, the supplementary use of organic agents may well assure the difference between long, uninterrupted operation and frequent boiler outages due to scale and sludge formations.

But a word of warning! Not all organics are the same or equally effective.

Take, for example, the case of a large mid-western steel plant which had to acid-clean its 450 psi boilers at 8-12 month intervals.

Due to sharp variations in the raw polluted river water, the hardness and silica content of the lime soda effluent could not be maintained consistently as low as desired. Despite the use of phosphate-tannin treatment, boilers opened up in poor condition.

Betz Engineers studied the problem and recommended changing the type of organic. Results? Since this change, the boilers have not been acid-cleaned or turbined in three years.

What's more, the latest inspection report after 11 months' operation, showed that the only deposit found in the boilers was a handful of sludge.

If *your* plant is plagued by scale and sludge deposits, why not do something about it *now*, by calling in a Betz Engineer. He'll show you factual evidence how Betz *Specialized* Water Conditioning Service can help you solve *your* water problem. W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

Write today for a copy of Betz Technical Paper No. 98, "Boiler Scale —Its Formation and Prevention."

BETZ

CONSULTANTS ON ALL WATER PROBLEMS

For more facts circle 523 on Reply Card

Smoke stack: Allegheny County Steam Heating Company, Pittsburgh.
Painting Contractor: Simakas Bros., Pittsburgh.
Aluminum Paint: James B. Sipe & Co.

→ *because*

ALUMINUM PAINT LASTS

Painted only three times since erection in 1929, this 160-foot brick-lined steel stack proves the long-life, money-saving qualities of aluminum paint. Now freshly painted for the first time since 1940, seven men were able to complete the job in nine hours. *This* proves the great hiding power and application ease that you'll find in every can of aluminum paint.

Alcoa does not make paint. But we do make the Alcoa Aluminum Pigments that go into the best brands. Together with our paint manufacturing customers, we've developed aluminum paints that lick industrial paint problems—heat, cold, dirt, moisture, smoke, corrosion and fumes.

If *you* have a smokestack, tank, roof, boiler or other facility that needs the best protection, you should investigate aluminum paint. Write to Alcoa today for information.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

FREE BOOKLET tells how to paint with aluminum.

Aluminum Company of America, Paint Service Bureau
1790-A Alcoa Building, Pittsburgh 19, Pa.

Please send your free book, *Painting with Aluminum*. I plan to paint_____

Name_____

Company_____

Address_____

City_____ Zone____ State_____

For more facts circle 524 on Reply Card

BACKTALK

(Backtalk begins on page 28)

Industrial Stethoscope

PLANT ENGINEERING:

"The November issue of the magazine contained a news item on page 49, headlined 'Stethoscope Listens to Burnishing Wheel.'

"Can you inform us who the manufacturer is as we would like to contact them to obtain descriptive literature on industrial stethoscopes?" *L. C. Stilp, General Purchasing Agent, Kimberly-Clark Corp., Neenah, Wisconsin.*

▶ The developer of this device was Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota. However, we are requesting Mr. John F. Budd, Jr., Carl Byoir & Associates, Inc., 10 East 40th St., New York, to send you whatever information is available on this stethoscope.—*Editors.*

Training Program

PLANT ENGINEERING:

"I note in your August issue you included in your 'Backtalk' Section, the item on our proposed Plant Engineer's Training Program. We appreciate this very much as it will no doubt promote comments from interested parties.

"It may interest you to know that we have already received a letter of suggestion from Robert Henderson Emerick, Professional Engineer." *H. S. Christiansen, Engineering Department, Carnation Co., Los Angeles, Calif.*

M.H. Conference

PLANT ENGINEERING:

"The article 'Economics of Materials Handling' in the October, 1953 issue, is very well written and covers the meeting so completely that I would like to give copies of it to some of our key personnel here at the plant. To this end, would it be possible to obtain ten additional copies of the report?" *P. A. Tannian, Manager Production Control Department, Ford Motor Co., Livonia, Mich.*

PLANT ENGINEERING:

"Many thanks for the preprint of the article on the Detroit Materials Handling Conference held on September 17.

"In reading through this report we find that it would be of great interest to the 55 members at large of the AMHS. These members are named as such since they reside where we have no chapters. They are located in the United States, Canada, England, Germany, Sweden, France, Italy, Finland, Australia, South America and Mexico.

"We would appreciate very much if you could send us 55 copies of this article so we can send them to our members at large." *Arthur E. Fryer, Administrative Secretary, American Material Handling Society, Inc., Toledo, Ohio.*

Analyzing Accidents

PLANT ENGINEERING:

"On behalf of the Materials Handling class at the Ford Motor Co., here in Cleveland, and myself, I want to thank you very, very much for the reprints of your very excellent article on 'Operational Analysis — Tool for Accident Prevention,' which appeared in the September issue.

"I like it and hope to have an opportunity to do something more than just issue it as a reprint. I'd like very much to incorporate it in a Material Handling analysis procedure." *J. F. Carle, Educational Director, Lincoln Extension Institute, Inc., Cleveland, Ohio.*

Employee Relations

PLANT ENGINEERING:

"We have read with considerable interest the article by Edward P. Davidson entitled 'Plant Engineer's Role in Employee Relations,' which appeared in the September, 1953 issue of the magazine.

"We would like to distribute this particular article to some of our plant engineers, and wonder if it would be possible to obtain about 12 copies of it." *A. W. Taff, Industrial Relations Director, General Railway Signal Co., Rochester, N. Y.*

Potential Member

PLANT ENGINEERING:

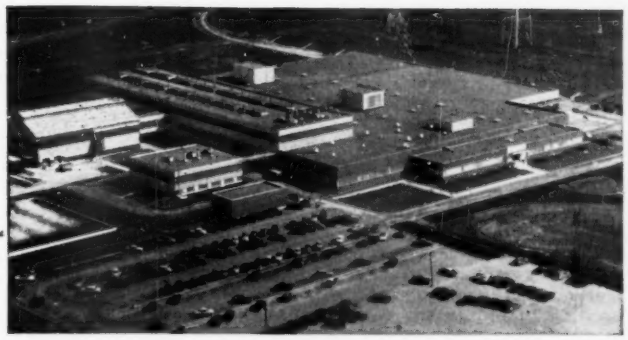
"I have been receiving PLANT ENGINEERING for several years now and have benefited by the fine technical information and news of other plants contained in your magazine.

"In fact, reading this magazine has created a desire to join the San Francisco Plant Engineers' Club. It would be very much appreciated if you will send me the name and address of the secretary of this club so I may contact him." *William C. Ritchie, Chief Engineer, Golden State Co., Ltd., Newman, Calif.*

▶ The man to contact for more information about the Plant Engineers' Society of San Francisco is Andy Caridis, Heat and Control, Inc., 285 Seventh Avenue, San Francisco 3, Calif.—*Editors.*

the *AUTOMATIC* answer to DIVERSIFIED TEMPERATURE REGULATION PROBLEMS . . .

JOHNSON CONTROL



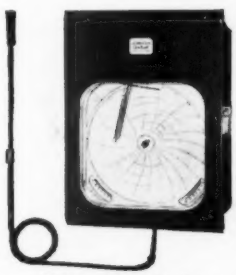
Owens-Corning Fiberglas Corp., Anderson, South Carolina. Lockwood-Greene Engineers, Inc., architects and engineers, New York and Spartanburg, S. C.; Carrier Corporation's Atlanta Office, air conditioning contractors.

Cloth from sand? Yes! That is what happens at the Owens-Corning Fiberglas plant at Anderson, South Carolina. Here, temperature and humidity conditions throughout the entire plant are controlled by Johnson.

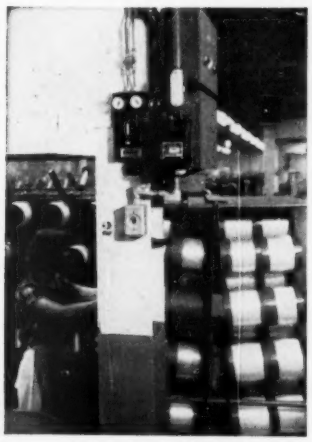
The Carrier centrifugal refrigeration machine, which furnishes the chilled water for cooling in connection with the air conditioning, is under the control of a Johnson T-1000 Single-Pen *Record-O-Stat*. In addition to acting as an accurate temperature controller, this instrument also insures that a continuous record of the temperature of the chilled water is always available for reference. This is important where industrial processes are dependent upon the space conditions. In the forming and finishing rooms, space temperatures are maintained at precise levels by Johnson T-800 Master and T-901 Submaster Thermostats which operate Johnson Valves and Damper Operators.

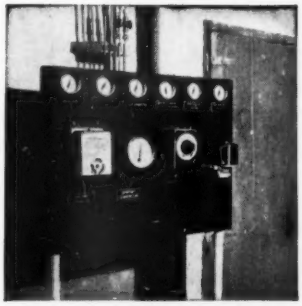
Finishing rooms, offices, cafeteria, shops, first aid room, kitchen and locker rooms are controlled by Johnson *Individual Room* Thermostats. All of the Johnson apparatus, engineered for the most exacting results, is combined into a complete Planned-for-the-Purpose, Installed-for-the-Purpose Control System. Another outstanding example of the adaptability of Johnson Control!

Whether *your* plant calls for the solution of intricate temperature and humidity control problems or merely the simple application of a single controller, call a Johnson engineer from a nearby Branch Office and get the benefit of over 60 years of experience offered by the *only* nationwide organization devoted exclusively to manufacturing, planning and installing automatic temperature and air conditioning control systems. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.



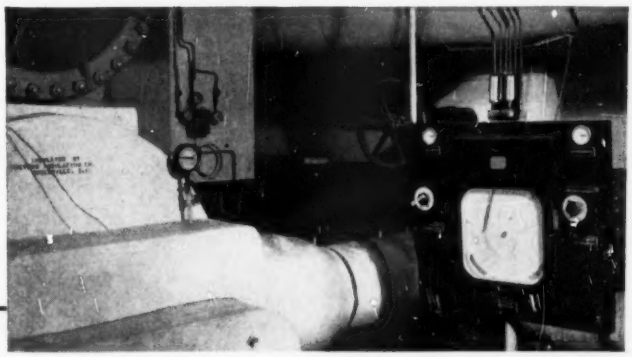
T-1000 Single-Pen *Record-O-Stat*



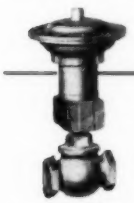


Temperatures in manufacturing and other areas are controlled by Johnson T-400 series Room Thermostats, one of which is shown above.

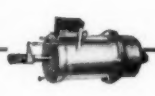
From control panel at left, a Johnson T-800 Thermostat controls the dew-point temperature of air leaving the air washer for the air conditioning unit serving a processing area.



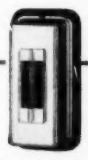
Above, a Johnson T-1000 *Record-O-Stat* regulates and records the temperature of the chilled water leaving the Carrier centrifugal refrigeration machine.



V-104 Coil Valve



D-265 Damper Operator with Pilot Positioner



T-403 Room Thermostat

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

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For more facts circle 525 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Electric Gun Saves Gears

ELECTRONS WORK for conservation these days in a Lockheed Aircraft Corporation machine shop. A flame-spitting, water-spurting electron gun makes parts costing $5.00 to $8.50 apiece as good as new for 7½ cents.

This saving is made possible by removing broken drill shanks from small bevel gears. These are used in air motors for right angle drilling in hard-to-get-at spots.

Water is used to cool hot rod which cuts slot in a broken drill shank section

The drill bit for one of these motors has a threaded shank which screws into the top of the motor's bevel gear instead of fitting into a chuck as in a normal motor.

Until recently whenever a drill shank broke off inside the end of the bevel gear, the whole gear piece had to be replaced. These drill shanks could not be removed because they were hardened steel. The only answer seemed to be to replace the gear.

Then the electron drill was recommended. This handy gadget goes sputtering down into the drill shank with a water-cooled electrode, something like a miniature, wetted welding rod, and burns a neat oblong hole in the broken-off section of the drill shank.

With this screwdriver-sized hole in the shank, the operator then takes a screwdriver, removes the old drill shank, and the gear is as good as new, ready to drill another 20,000 holes.

The use of this device has been responsible for reclaiming 1,500 gears in six months in just one of the machine shops. *From the Lockheed Star, published by the Lockheed Aircraft Corporation, Burbank, Calif.*

Roofs vs Flames

FIRE-RETARDENT ROOF construction for industrial plants has been developed to overcome the fire hazards present in conventional plant roofs. A supplier of engineered products for the construction industry, demonstrated and tested this roof construction at two recent fire tests in Cleveland.

In both tests, intensely hot, kerosene-fed flames subjected specially built test roofs to conditions comparable to a highly destructive plant fire. The results of these tests highlighted the inflammable nature of standard roofs in contrast to the fire-retarding characteristics of the new-type roof.

Fire retardent and standard roofs appear left, right respectively, few minutes after their simultaneous ignition

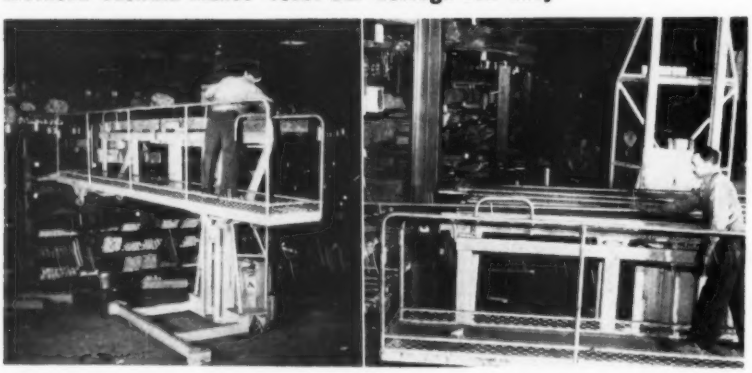
Currently much attention is being devoted to the problem of developing a better plant roof. Interest is widespread and stems from the lessons learned from a recent disastrous fire where combustible roof materials contributed to the holocaust which caused an estimated $40 million damage.

In the first fire test, roof panels representing conventional and Lexsuco-type roofs were fired in succession. At a second test, held to obtain further data and substantiate the results of the earlier test, the roofs were fired simultaneously. Temperatures of 1400 to 2000 F were recorded in these tests.

Observers at the tests saw the standard roof panels, fed by combustible gases and dripping bitumen from the roof, quickly turn into roaring infernos. The intense heat, vast quantities of dense smoke and secondary fires produced by the standard roof would have made control or containment of such a fire impossible.

In marked contrast, the new-type roof did not feed the fire and survived relatively intact without producing any secondary fires or smoke. Fire officials at the tests commented that a fire of this type could have been successfully fought. *From a release of Lexsuco Incorporated, Cleveland, Ohio.*

Elevated Catwalk Makes Steel Bar Storage Job Easy

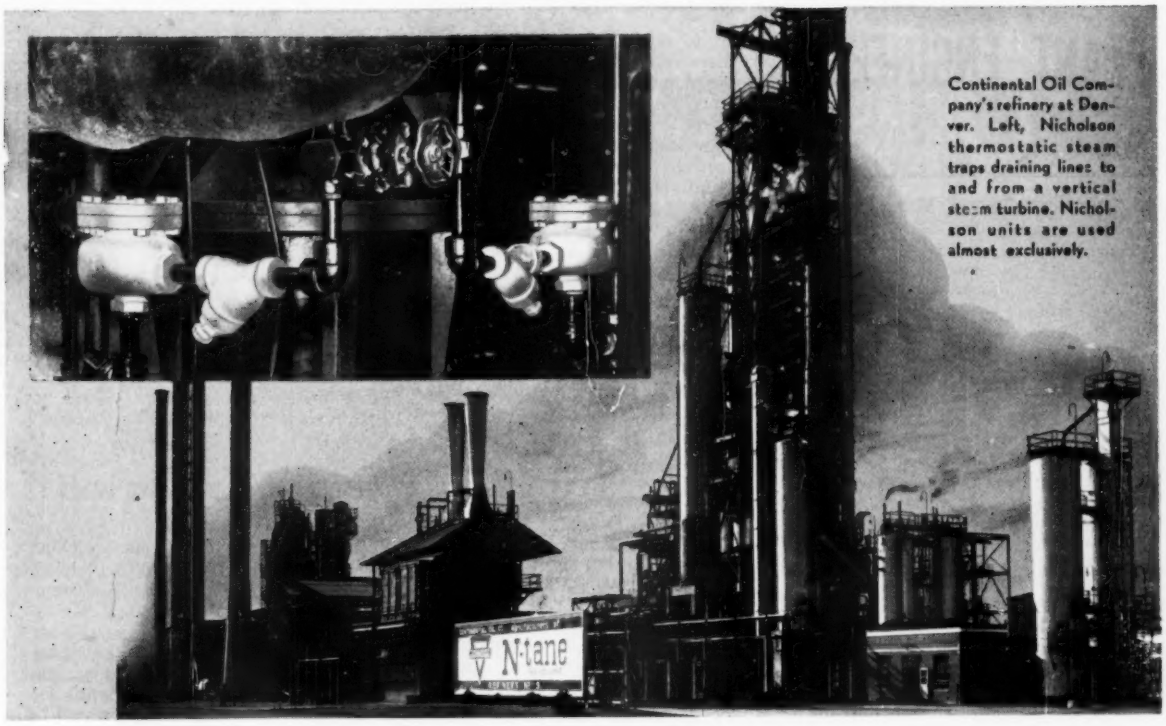


Steel company uses this system to store 24 ft long bars weighing up to 6,000 lb. Operator travels on detachable platform and positions the adjoining conveyor by remote control. Bars are pushed manually over rollers into proper rack section. (From Lewis-Shepard Lever, published by Lewis-Shepard Prod., Inc.)

Vacuum Forming of Plastics

MANUFACTURERS are showing increasing interest in the use of parts and products vacuum formed from plastic sheet because of the latitude in design and saving in assembly which this method makes possible.

Auburn Button Works, which is the oldest plastic molding company



Continental Oil Company's refinery at Denver. Left, Nicholson thermostatic steam traps draining lines to and from a vertical steam turbine. Nicholson units are used almost exclusively.

NICHOLSON TRAPS SELECTED for CONOCO Refinery

This Continental Oil Company refinery has adopted Nicholson steam traps because they proved most effective generally in improving heat transfer. This is an advantage which, we believe, is important to plant men in every industry. A recent survey showed these Nicholson features to be the reasons why plants with standardization-for-economy programs are increasingly adopting Nicholson traps: (1) Two to six times average drainage capacity. (2) Operate at lower temperature differential. (3) No air binding. (4) Freeze-proof. (5) Only one moving part. (6) No change of valves for varying pressures. (7) Record low for steam waste. For process, power, heat.

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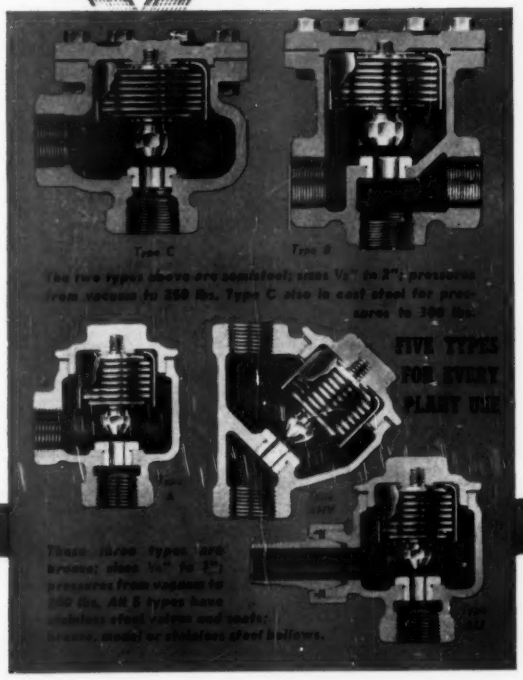

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PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

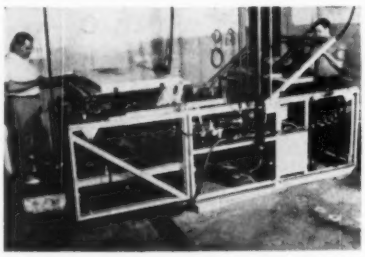
in America, has pioneered in the process of vacuum forming. The machine used for this purpose at the Auburn, N.Y. plant consists of a rectangular steel frame. At each end is a flat plate to which vacuum lines are attached. A heating element, traveling on longitudinal rails, is alternately rolled over each of the molding areas.

The molds are placed on the flat plates over the vacuum parts and sheet clamping devices positioned to seal the sheet tightly to the tops of the molds. The heating element is rolled into position over the sheet.

When the sheet is thoroughly plasticized, the vacuum is released, evacuating the air beneath. The atmospheric pressure above the sheet forces it into the contours of the mold, reproducing the shape of the pattern.

The heating screen is rolled back and the sheet frame clamp released. A jet of air is blown over the formed sheet to cool and harden it and it is then removed. The thermostatic material is sufficiently flexible to be stripped quite readily from the mold by hand, even though there may be a moderate degree of under cutting.

Vacuum forming equipment itself is relatively inexpensive, and the production rate is usually comparable to other methods. Low die costs, particularly on short runs or



Man at left of vacuum forming machine is heating plastic sheet while other worker is cooling the molded product

where there are frequent model changes, and the ease and speed with which dies can be made, are outstanding virtues of this process.

One good example is the small door panel on the freezing unit of a new refrigerator. If pressure molded, the dies for this one small unit would have cost $8,000 and delivery would have been four months. Since the part was vacuum formed, the dies cost only $1,250, and the panels were actually in production four and a half weeks after the first blueprint was received from the customer.

For a long time the prophets of industry have held forth the promise of a new world in which everything from boats to auto bodies and furniture to prefab homes will be inexpensively mass molded in plastic. Perhaps sheet forming will be the means of turning these promises into realities. *From a release for Auburn Button Works, Inc., Auburn, New York.*

Handling of Peak Steam Loads

UNTIL TEN YEARS ago, it was not uncommon for certain process plants to install additional steam generating capacity to meet increased steam load requirements as they would take place.

It was considered more economical, despite the infrequency and short duration of peak demands experienced by some plants, to add a new primary steam generating unit

(Continued on page 40)

System Automatically Measures and Controls Liquid Density for Industrial Processes

PRACTICALLY EVERY MAJOR INDUSTRY has a process requiring density control of some material. Liquid densities of solutions, pulps, and slurries, especially, have been particularly difficult to measure and control because of non-uniformity of the mixtures.

An effective and simple answer is by the application of air pressure, using bubbler pipes and constant differential controller. By this method not only can density be easily measured but also consistent density control can be accurately obtained.

The controller is connected to two pipes that extend an arbitrary distance below the surface of the liquid. A fixed difference in length between the ends of the two pipes is utilized as the base differential pressure.

This pressure is developed by passing a small controlled flow of air through both pipes and, by means of suitable connections, transmitting the resultant differential pressure head between the two pipes to the differential controller.

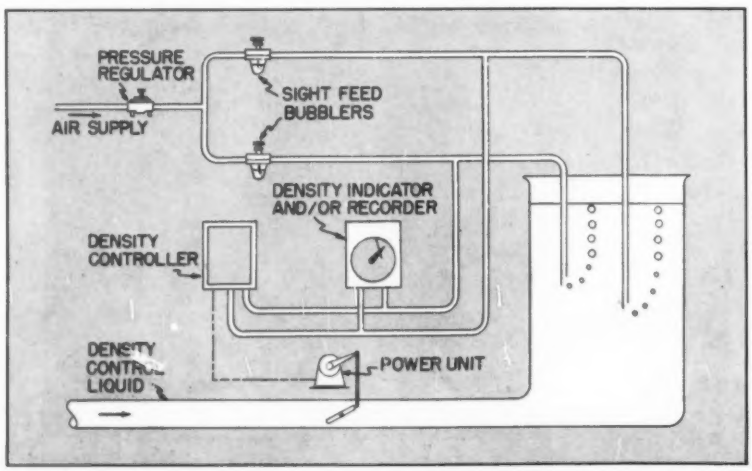
The controller is manually set to the differential pressure developed by the system when material of correct density is within the tanks.

A separately mounted power unit operated by the controller positions a valve in a connection to the tank in order to control the flow of liquid or solids required to maintain the desired density.

A variation in liquid density changes the differential pressure on the controller, which in turn causes the valve to move to whatever position is required to maintain constant liquid density. Variations in liquid level will not affect controller operation.

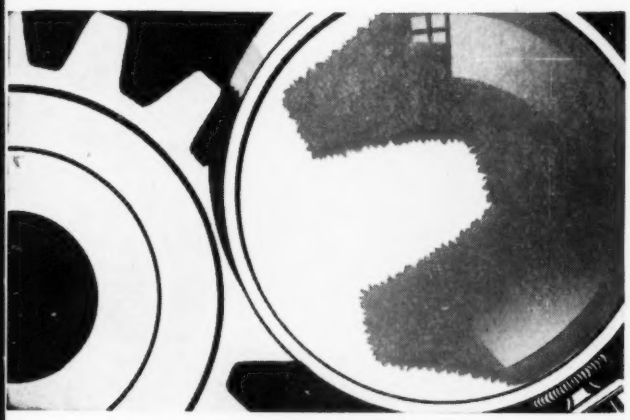
This constant differential controller is the proportional type with automatic reset so that compensation for capacitance is secured and a constant liquid density is maintained regardless of the position of the valve. It should be used only in processes where density can be measured quickly after change in the control variable.

A differential air pressure indicator-recorder can be utilized as a direct reading liquid density meter since the differential air pressure being measured can be calibrated accurately in units of liquid density. *From Metrol, published by Metrol Co., Detroit, Michigan.*

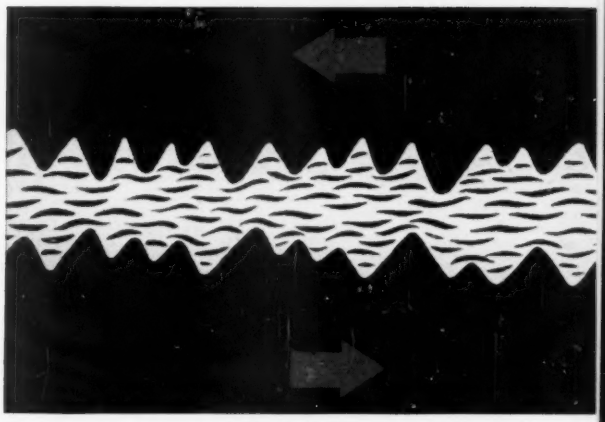


Drawing shows piping and equipment for measure and control of liquid density

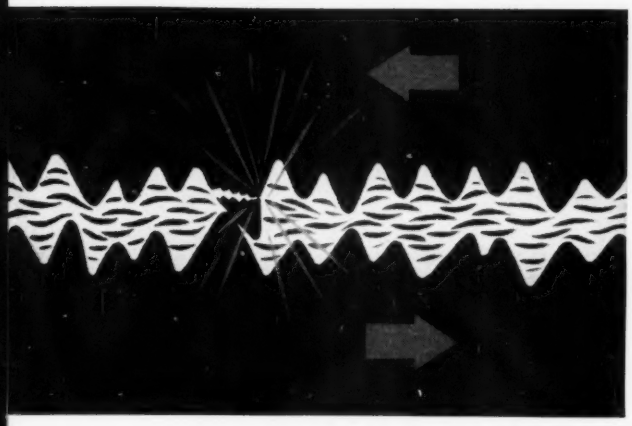
HOW SUNEP PREVENTS GEAR WEAR



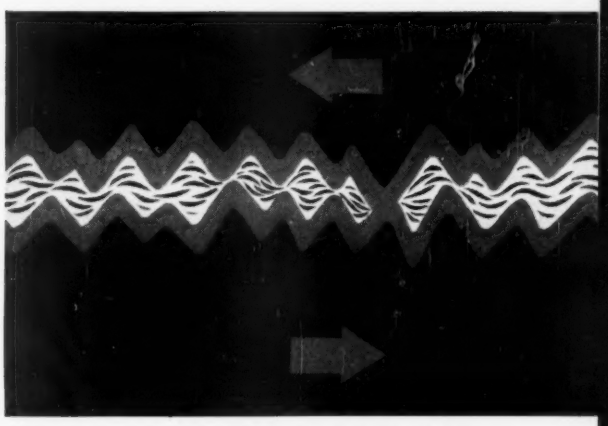
The surface of a gear may seem smooth, but when greatly magnified it looks something like this. The lubricant must keep these jagged edges apart.



With ordinary oil, a thick film is needed to keep these metal surfaces apart. The thickness of the film depends on the viscosity of the oil and other factors.



It is difficult to maintain a thick oil-film in everyday practice. The oil film thins out and semiboundary lubrication results. With ordinary oil, metal to metal contact occurs and gears wear.



Sunep coats the surfaces with a chemically bonded film which is virtually unbreakable. This film, although only about 0.0000001" thick, keeps the surfaces apart, withstands heavy loads and sudden shocks, prevents wear.

Sunep has many advantages. In addition to its outstanding load-carrying ability, it is noncorrosive; it keeps gears and bearings clean; it prevents rusting; it stays put. And its additives do not drop out during use or after prolonged storage. For more information about Sunep and how it protects your equipment, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-1.

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PITT CHEM licks weather at Ford Rotunda

When the Ford Motor Company remodeled the well-known Ford Rotunda for its 50th Anniversary exhibits last year, protection of new steel dome supports against year-round exposure to weather and industrial atmosphere was a high priority project. Ford maintenance engineers specified Pitt Chem Tar Base Coatings. You'll discover, too, that no other material does such a complete, economical job of protection.

Pitt Chem Coatings are formulated from coal tar pitch for one and just one purpose—to *stop corrosion*. They're tough. They're durable. And their applied film is up to ten times as thick as ordinary paint. What's more, you don't need special equipment or a degree in engineering to apply them.

If that sounds like the kind of a hard-working, never-say-Uncle protective coating you've been looking for, let's have your maintenance experts and ours make contact. A survey will cost nothing. A letter or phone call will get it started.

W&D 4957

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PITT CHEM 103—General Purpose Coating
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PITT CHEM 107 PACHKOTE—Specialty Coating
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BULLETINS just released and of immediate plant interest

MAINTENANCE

101 Protection By Paint—Use of protective coatings based on chlorinated rubber is discussed in this illustrated 20-pp bulletin. Photo show water and sewage plants, storage tanks, where coatings have been exposed to corrosion. Includes performance data on company's finishes and instructions for applying paint to metal, wood and other surfaces. Hercules Powder Co.

102 Painting with Aluminum — Again made available to plant engineers is Form AD-220, 32 pp, on the use of aluminum paint. Discusses advantages of aluminum paints, describes three basic types: for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture and practical suggestions for good results included. Use of aluminum paint on steel, galvanized metal, wood, masonry and other surfaces is detailed. Aluminum Co. of America.

103 Protective Coatings — This 12-pp booklet describes Micro-Seal coatings, asphaltic compounds of a special chemical dispersion type. Nonflammability, freedom from odor, flexibility, easy application, low maintenance and other advantages are detailed and typical applications pictured. Specifications of these corrosion proofing coatings are included, also directions for use. Anderson-Prichard Oil Corp.

104 Coal Tar Protection—This 8-pp booklet describes Tapecoat, a close-woven fabric saturated in coal tar so coating is on both sides and serves as both protection and bond. Fully illustrated, discusses use of this protection on pipe lines, conduit, tanks, couplings. The Tapecoat Co.

105 Corrosion, Abrasion Control—Modern practices and products for the positive protection of metal equipment from the effects of corrosion and abrasion are described in this 16-pp bulletin. Covers factory and field application of rubber or synthetic linings to metal parts or products, and maintenance coatings available for application by plant personnel. Also gives detailed information on accelerators, thinners, primers, coverage. Goodall Rubber Co.

106 Easier Power Plant Cleaning—This 42-pp pocket-size handbook, "How to Make Power Plant Cleaning Easier," gives methods and solution concentrations and temperatures used in all types of power plants for the tough cleaning jobs. Covers the cleaning and descaling of surface condensers and heat exchangers; cleaning of compressors, steam turbines, filters, boilers, gas burners and electric motors; the removal of carbonized oil from copper cooling coils, and varnish from steel plates. Also discusses methods of stripping paints from various surfaces. Includes sections on steam detergent cleaning and on maintenance cleaning. Oakite Products, Inc.

CONSTRUCTION

107 Metal Roofs—Six-pp work-piece type bulletin in "proof" form explains how to estimate cost of material and labor for company's terne metal roofs. Gives data and work tables for determining roof areas by measurement or calculation; includes method for figuring required rolls of terne metal for specific roofing job and formula for price calculation. (Plant engineers are invited to suggest improvements for final form of this bulletin, and awards are offered for good suggestions.) Follansbee Steel Corp.

108 Insulated Panels—Illustrated in full color, this 8-pp bulletin describes factory assembled insulated metal panels for economical exterior wall construction. Discusses advantages and shows colors and textures which may be specified. Application suggestions are given, also specifications; typical construction details are shown. The Steelcraft Mfg. Co.

109 Plastic Materials—This 30-pp booklet gives information on materials of construction for use in chlorine dioxide production and bleaching processes. Technical articles included in this booklet cover plastic materials, protective coatings, corrosion resistance of plastics, and plastic processing equipment. The Atlas Mineral Products Co.

110 Panel Cutting Chart—A chart for quick calculations on sawing Presdwood into the most economical sizes is offered to plant engineers. This pocket-size calculator shows sizes to order from 10 standard lengths and various widths. A single setting of the chart shows the strips or pieces of the size wanted that may be cut from various widths and lengths, the percentage of panel that would be used in each width or length and the lowest cost cuts from the panels. Masonite Corp.

The Reader Service Card below needs no postage. Just circle item numbers of all bulletins wanted. Be sure to include your name, your job title and company name.

111 Low Temperature Insulations—This 20-pp booklet covers Fiberglas insulations for low temperature structures and equipment. Discusses design considerations, sets standards for vapor barriers, outlines application methods, and covers dry wall and hot dip constructions and self-supporting partitions. Products described include preformed insulation, asphalt-enclosed board, roof insulation, dual temperature pipe insulation, others. Book is well illustrated with photos, sketches and charts. Owens-Corning Fiberglas Corp.

112 Plant Daylighting—Bulletin 539 illustrates the use of Resolite for plant daylighting. Installation photographs and detail drawings show use of this translucent, corrugated plastic sheet in skylighting and continuous sidewall lighting of corrugated construction. Diagrams use in sidewall lighting of non-corrugated construction. Resolite Corp.

113 Transite Ducts—This 12-pp illustrated bulletin presents installation and maintenance information on conduit for exposed work and installation underground without concrete encasement, and Korduct for installation in concrete. Bulletin shows how these materials have cut cable subway costs in public utilities and telephone companies and other industries. Johns-Manville.

MATERIALS HANDLING

114 Lift Trucks—Catalog 35, a 20-pp illustrated reference guide on material handling equipment, describes the Stuebing hydroelectric, hydromatic and Red

January, 1954
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PLANT ENGINEERING

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Use this space to ask for tear sheets, other information wanted.

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Arrow lift trucks. Gives sizes and specifications on single stroke and multi-stroke models. Lift Trucks, Inc.

115 Pickup Trucks — Electric pickup trucks for a wide range of transportation and hauling jobs are described in an illustrated folder. Stresses their economical operation and minimum maintenance. Gives specifications of a ¼-ton model and a ½-ton flat-bed truck. Autocar.

116 Electric Trucks—This condensed bulletin on electric-driven industrial trucks gives data on the "Dynamotive," a gas fork lift truck with electric transmission, designed to combine the long service and operating advantages of electric trucks with constant power source of a gas engine. Automatic Transportation Co.

117 10-in-One Conveyor—This illustrated bulletin features an adjustable conveyor which can assume up to 10 usable positions each suited to a different application. Stresses economy of this flexible unit and explains construction. Stewart-Glapat Corp.

118 For Cable Handling—The Reel-O-Matic, for handling cable and wire rope, is featured in this illustrated bulletin. Shows how its one-man operation saves time and labor, and how its compact design saves storage space. Describes models with motor-operated and manually-operated platforms. Reel-O-Matic Corp. of America.

119 Hand Hoists—Eight-pp Bulletin P-1254A describes company's Load King hand hoists, capacities from ½ to 3 tons, designed for faster and easier lifting. Illustrates company's Synchro-matic load brake. The Yale & Towne Mfg. Co.

120 Freight Car Spotter—A small, gasoline-powered roadable locomotive engineered to push or pull up to three freight cars around curves, over switches and through crossovers is described in this 6-pp bulletin. Discusses its economical and easy operation. Hemco Mfg., Inc.

121 For Long Range Handling—In this brochure on long range handling machines, line drawings are utilized to show how the drag scraper, slackline cableway and tautline cableway operate. Pictures many types of equipment on the job and provides information on scraper storage, excavation and the use of scrapers with boom machines. Sauerman Bros., Inc.

MECHANICAL POWER TRANSMISSION

122 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail, along with dimensional data. Includes standards for bore specifications. Thomas Flexible Coupling Co.

123 Power Transmission Equipment — Flexible couplings, variable speed pulleys and transmissions, and universal joints are presented in this illustrated 8-pp bulletin. Specifications, dimensions and design information are provided, also references to detailed literature covering each class of equipment. Lovejoy Flexible Coupling Co.

124 Geared Flexible Couplings — Folder 2375 describes and pictures geared flexible couplings offering light weight and high capacity for high speed and high torque applications. Link-Belt Co.

125 Gearmotors—Bulletin B-5645, 16-pp, describes company's Life-Line gearmotors. Discusses features of gear unit and motor, giving gear ratios for single, double and triple reduction types. Describes other types developed for particular requirements. Westinghouse Electric Corp.

ELECTRICAL

126 Synchronous Motors—Electrical operation of synchronous motors and areas where control is essential are discussed in 16-pp illustrated Bulletin GEA-5873. Problems common to these motor applications and their solution by use of correct control equipment are explained in a question-answer technique. Describes various control units, gives ratings and dimensional data. General Electric Co.

127 A-C Motor Frame Chart—This selection wall-chart which shows comparison between old and new NEMA standard dimensions for a-c motors from 1 to 30 hp provides a handy reference for determining differences in frame dimensions. Covers dimensions for polyphase squirrel-cage, polyphase wound-rotor, and single-phase, foot-mounted motors, also flange-mounted motors, drip-proof and totally-enclosed, fan-cooled types. Old dimensions are shown in blue, new ones in red. Westinghouse Electric Corp.

128 Motor Control—Company's Limitamp high-voltage motor control, its operation and application are described in 16-pp picture-story Bulletin GEA-5409B. Uses photographs, charts and diagrams to explain control system's economic and safety features, accessory and component equipments. Typical dimensions of full and reduced voltage control panels are included. General Electric Co.

129 Motor Lubrication—Three methods of lubricating electric motors—cartridge, standard open and company's Lubrifiush—are compared in 8-pp Bulletin 1848. To demonstrate action of re-lubrication in Lubrifiush bearings, a series of natural color photos of a transparent bearing housing is reproduced. Necessity of annual lubrication is demonstrated photographically. U. S. Electrical Motors Inc.

130 Toggle Switches — Four preliminary data sheets now available cover new toggle switch designs. Sheet P72 describes two pole switches with three hole mounting; Sheet P81, four pole, double-throw switches; Sheet P82, three pole, double-throw types; and P83 two pole, panel mounting types. Micro Div., Minneapolis-Honeywell Regulator Co.

131 Redesigned Transformers—Illustrated Bulletin 501-15, 12 pp, features a line of redesigned dry-type power circuit transformers. Tells how transformers from 1 through 15 kva are now smaller and lighter than previous units, due to a change in insulating materials. Includes wiring diagrams. Jefferson Electric Co.

132 Cord Sets—Twelve-pp Bulletin CS-1, "Design Guide for Custom-Built Cord Sets," illustrates standard molded parts available, including male plugs, female connectors, strain reliefs and junction boxes, and types of flexible cord on which they can be molded by company. Whitney Blake Co.

METALS, METAL PRODUCTS

133 Aluminum Strip—This 20-pp booklet covers company's work in production of Truspec cold-rolled aluminum strip and tells advantages of this product. Explains method of determining directional proper-

(Continued on page 185)

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You won't face such problems with a Clark Balanced/Opposed, Motor Driven Compressor. There are no vibrations . . .

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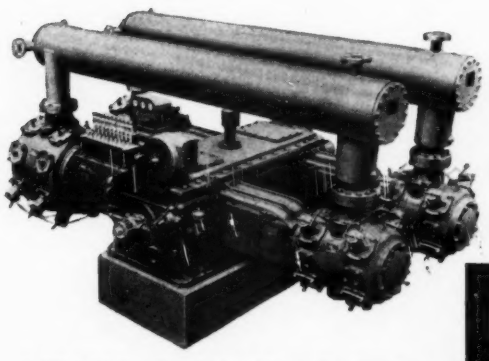
If you'd like to install a Clark unit on an upper floor that's structurally strong enough to support its weight, *do it* . . . and you won't need much space, either. Its compact design permits installing a large amount of horsepower in a limited floor area . . . and its precision construction means you can practically forget about it once it's in operation.

For complete details on this truly modern air compressor in the 150 to 4500 hp range, write for Bulletin 118 or get the facts first hand from your nearest Clark representative.



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Put a Horton® elevated tank to work for you and be assured of an independent water supply that is available at all times for *general service—domestic needs—fire protection.* And hand in hand with increased plant fire protection goes lower fire insurance premiums.

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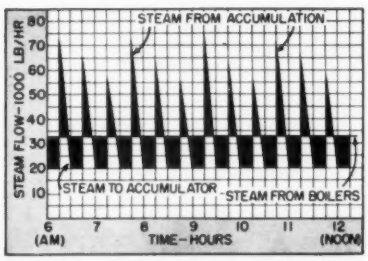
PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

because it was recognized that a boiler is more versatile than a steam accumulator, and the cost, at the time, was only slightly higher.

However, there were disadvantages in this practice: The imposition of widely varying steam loads upon the boiler plant made it difficult to secure steady and efficient operation of the unit. Furthermore, the boiler had to be large enough to supply the demand steam load, even though these peaks may have accounted for only a small part of the total operating time.

The economics of the situation have undergone a drastic change in



Flow chart shows steam supplied by boiler to accumulator and from the accumulator at times of high demand

the last ten years. Costs of steam generators have risen sharply, while costs of steam accumulators have increased only moderately.

Therefore, the price differential gap between the two types of equipment has become so widened so as to have forced a reconsideration of the steam accumulator as an economically sound investment with a surprisingly short payoff time for process plants.

Package steam generator development, with its low maintenance and automatic operation features presents a further incentive for the application of the steam accumulator.

When used in combination, the package steam generator and accumulator represent an extremely low-cost medium for obtaining steam both for the base load and intermittent peak periods.

A typical situation in which a combination package steam generator and steam accumulator may be readily applied is indicated in the accompanying steam flow chart.

The chart is based on the assumption of performance in a processing plant requiring a base load of 20,000 lb per hr at 240 psig and 40,000 to 60,000 lb per hr of low pressure steam at 100 psig for process work. It illustrates how a total steam load ranging as high as 80,000 lb per hr may be obtained.

While in no sense a competitor of

the standard type steam generator, the steam accumulator is generally considered to be more economical when used in its proper field of application, namely steam systems in which there are appreciable fluctuations in steam demand, with peaks in excess of, and corresponding downward demand less than, the average output of the boilers. *From Heat Engineering, published by Foster Wheeler Corp., New York City.*

Hydraulic Oil Needs Attention

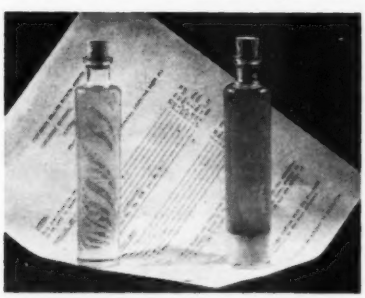
FOR LONG and trouble free service on hydraulic units—check the oil. Check to make sure the oil used meets the equipment manufacturer's specifications. Check to see that it is kept clean and free of foreign matter. And finally, make sure it is changed as often as recommended.

That is not an oversimplified approach to preventive maintenance. Analyses of service calls on hydraulic equipment in the field show that 70 per cent of the trouble can be traced directly to the condition of the hydraulic oil.

In the case of one plant, for example, a sample of contaminated oil was taken from a machine after its hydraulic unit had been returned to the manufacturer for a major overhaul. When disassembled, many of the unit's component parts were found to be badly corroded. The oil was suspected, so a sample was obtained from the machine reservoir.

An analysis showed it to be of an inferior grade, lacking the oxidation and rust inhibitor additives present in oils recommended for use in this particular unit. The lack of these additives gave the oil poor stability properties, especially when in contact with water.

This was a major fault, since the sample contained about 3 per cent



Contaminated oil taken from machine reservoir appears on right. Vial on the left holds clean oil for comparison

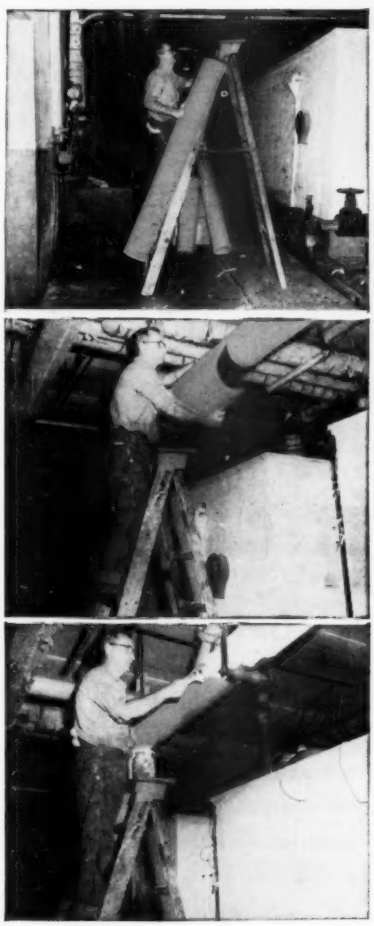
water soluble coolant. It was later discovered that the same buckets were used to fill the oil reservoir as were used in replenishing the coolant.

Oil containing abrasive particles, for example, can also result in trouble by causing excessive wear on moving parts. A scratched piston

Have you tried "that new snap-on PIPE INSULATION?"

"That new snap-on pipe insulation" that's causing so much comment in industry is G-B ULTRAFINE PIPE INSULATION. It's the first and ONLY one-piece molded pipe insulation of fine glass fibers — ideal for hot or cold piping, for plant maintenance or new construction.

To the many advantages you see illustrated below, you can add ECONOMY. G-B ULTRAFINE PIPE INSULATION costs no more than other insulations, and users report APPLICATION SAVINGS UP TO 50%!



ONE MAN, ONE HAND — that's all it takes to handle new G-B ULTRAFINE PIPE INSULATION. (This 6-foot section weighs just a shade over 2 lbs.!) No harm done if the workman should drop it — for this insulation is flexible and resilient, won't break or crumble.

A "SNAP" TO APPLY — simply pull the single seam apart, and G-B ULTRAFINE PIPE INSULATION snaps itself around the pipe! No special tools or skills required. With any knife, you can readily cut this new insulation to go around obstructions.

EASY TO FINISH — simply close seam tightly with any standard type fastener — then paint . . . leave "as is" . . . or finish as desired. Thermal efficiency of the finished job is so superior that you get the same "heat saving" with less wall thickness!

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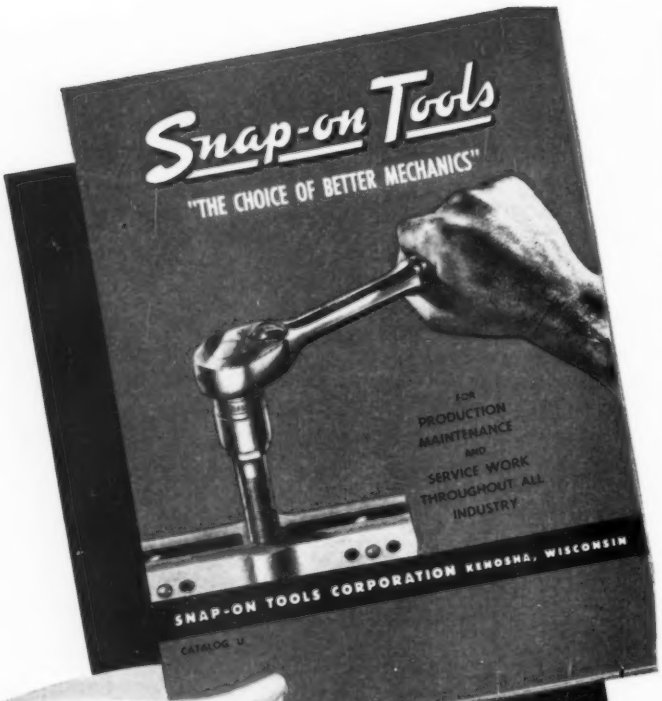
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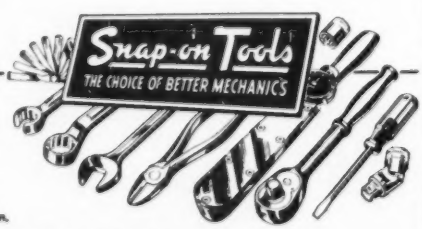

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PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

in a hydraulic unit permits an excessive amount of slippage.

Improper oils in themselves can also cause damage, even though care is taken to keep the oil free of abrasive particles and contaminating elements. Chemical or physical changes in inferior oils often result in the formation of lacquer deposits or sludge which can easily clog the hydraulic lines and valves.

Rusting may occur if the oil lacks the additives necessary to offset the effects of moisture or oxidation. *From Report from Cincinnati Milling, published by the Cincinnati Milling Machine Co.*

Pump Motor Explosion

TO AN ENGINEER, the explosion of an a-c motor due to overspeed would be questionable, since such an occurrence is not common with this type of motor.

The speed of such motors is a function of the line frequency, and unless there is some radical change in the frequency, the speed will not exceed safe limits, regardless of the motor's load.

So an engineer would want to know more about the circumstances surrounding this failure before accepting the statement that overspeed was the cause.

For example, an eastern power plant was the site of just such an accident. The motor involved was one of a pair that was used to drive identical boiler feed pumps. Each pump discharge pipe was fitted with a stop valve and a check valve.

The discharge lines from the two pumps joined at a "Y" connection to form a single feed line to the boiler. This common feed line was also equipped with a stop valve and a check valve.

Only one feed pump was used at a time, but operating routine at the plant called for changing pumps every 24 hr. At the time of the accident, the water tender was changing pumps in the customary manner.

The pump that he was shutting down will be called "A." This is the pump that failed. The water tender first started pump "B" and, after it had come up to speed, he pulled the switch for pump "A."

When he had done this he noticed that discharge pressure in the feed line was dropping. Figuring that something was wrong with pump "B," he reclosed the switch on pump "A." Smoke poured out of the end bells for an instant, and then the motor exploded. The end bells broke and flying pieces struck a workman.

When the motor was examined

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Above: Joy WNO-112 Oil-Free Compressor

Below: Joy WGO-9 Oil-Free Vertical Compressor

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★ Carbon graphite compression rings designed to compensate automatically for wear.

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★ Complete line of types and sizes of compressors to meet *any* capacity and pressure requirements. ● Let us quote on your air supply needs of any nature. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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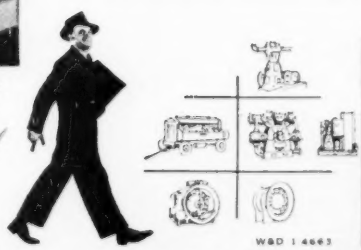

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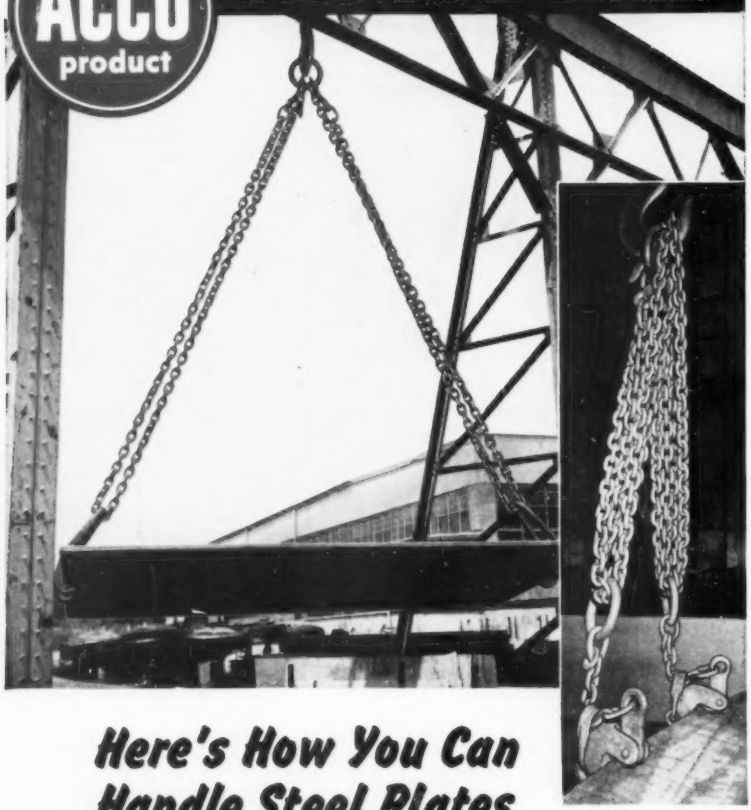

Here's How You Can Handle Steel Plates

• These pictures show only two applications of an AMERICAN 125 Endweldur alloy ACCO *Registered* Sling Chain with ACCO series 80 Sling Hooks. The 2 legs are long enough for use with various length plates. They can also be used in a double-basket hitch for lifting two or more plates together.

The big advantage in using this AMERICAN Chain is in the small diameter, light weight, and great strength of the tough alloy chain, and in the short links which make the chain so flexible and easy to rig. See it in the right hand picture above.

Inside the plant this same sling chain is used in a wide variety of lifts on castings, housings, and finished machines. It has become sort of a "jack-of-all-trades."

AMERICAN makes sling chains for every use with ACCO grab, sling, foundry, and special hooks. Note (*above*) the two ACCO *Registered* Sling Chains on the plate grabs. The ACCO Sling Chain Catalog gives you full information on America's finest chain slings—AMERICAN.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

after the accident, its condition definitely indicated overspeed. The end rings on the squirrel cage rotor had burst and thrown out. This broke both end bells and sent metal flying in all directions. The motor windings were, of course, torn by pieces of the broken rings and bars.

Explanation of the overspeed came when it was determined that the check valve in the discharge line stuck open when the water tender shut down unit "A." The discharge from pump "B" taking the path of least resistance, entered pump "A." through its discharge line, causing the unit to run backwards.

Although it was normally the driven part of the unit, the pump became the driving member and, running without speed control, the unit raced to destruction. *From the Locomotive, published by the Hartford Steam Boiler Inspection and Insurance Co., Hartford, Conn.*

Weather Conditioned Concrete

Wrought iron pipe coils are used in aprons of new hangars by Grumman Aircraft Engineering Co. at the Peconic River plant, Riverhead, Long Island. The big hangar doors are expected to move freely in their tracks during freezing weather. (From an A. M. Byers Co. release, Pittsburgh, Pa.)

Steel Reclamation Ideas

FOR YEARS, bits of metal were hauled out of a Youngstown Sheet and Tube plant and thrown on dumps. Workers knew that iron was found in refuse that was being disposed of but the particles contained therein were too small to be recovered by ordinary methods.

One of the employees, considered this situation and came up with a magnet shaped like an ice cream cone. Dropped on a refuse pile the magnet sinks into the material. As current is turned on, the magnet attracts particles of metals which are

Recipient of award and his superintendent stand before a cone magnet

This is a bed of steel spikes designed to break apart scrap steel bundles

lifted out of the refuse, dumped into cars and taken to the blast furnaces to be reused. It is estimated that this device recovers about 150 tons a month.

Another idea that is being patented for Mat Bozichovich, originator of the magnet design, is a scrap bundle opener. When dealers prepare scrap for furnaces, they put it in a press which exerts 1,300 psi pressure. Sometimes, things get into those bundles which do not belong in them. Suspicious steelmen tried to cut them open; they used torches; they used dynamite. None of these methods was successful. In blowing the bundles apart, the evidence that was sought was destroyed.

As a solution to this problem, the idea of dropping the bundles from an overhead crane onto a steel plate was developed. It was put into practice and the idea worked. The bundles flew open and exposed everything inside. *From an article in The Bulletin, published by Youngstown Sheet and Tube Company, Youngstown, Ohio.*

Overhead Oven Saves Space

DRYING TIME for sprayed parts was running too long at the Cleveland plant of National Grille and Register Co. In looking for a solution to this problem, consideration had to be given to the lack of floor space for new equipment. Both of these obstacles of time and space were overcome nicely by the installation of an overhead infra-red oven.

This oven hangs parallel with the ceiling some eight feet above floor level, looking more like a ventilating shaft than a drying device.

an ACCO product

You Can Lift 2 Tons 20 Feet with this WRIGHT Speedway Hoist

• If the ceiling is high and material must be moved over machinery and partitions, or if you want to lift from basement to second floor, here's a hoist that will do it.

The L-1 WRIGHT *Speedway* has a lift of 20 feet and is reeved with a 4-part single line that wraps in a single layer on a grooved drum. In either of two speeds, lifting or lowering is smooth and stable, so it is fine for either intricate lifting jobs or production material handling.

Motors of the L-1 WRIGHT *Speedway* have 30-minute ratings. In addition the L-1 has the five key long life features of all Frame 1 WRIGHT *Speedway* Hoists. These are: heat-treated and surface-hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake, and ball bearing gear shafts. And there are others.

See your WRIGHT Hoist distributor today or write today to our York, Pa., office for DH-425

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To manufacturers who have dust problems...this announcement is of the utmost importance.

DAY Type "AC" (reverse jet) Dust Filters are now being furnished with SELF-ADJUSTING BLOW RINGS, made under DAY and Hersey patents. This DAY improvement, to an already efficient dust filter, is now offered to industry after months of study and operation.

Wool felt and probably any other material with similar efficient filtering characteristics is inherently dimensionally unstable. DAY'S SELF-ADJUSTING BLOW RINGS automatically compensate for any variation in the filter tubes due to changes in temperatures, pressures, moisture conditions, etc. They assure perfect ring to cloth contact.

If you have a dust problem write toDAY for Bulletin 528-R.

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A SINGLE UNIT OR A COMPLETE SYSTEM

For more facts circle 536 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

Heart of this enclosure is the rod type infra-red element. Thirty of these hard working 3 kw units, flanking either side of the 36 ft bake tunnel, dry hundreds of grills and registers an hour.

For flexibility, the oven has four component sections of four infra-red banks each. An exception is the final section which housed three. Each section and its upper and lower banks can be heat-controlled individually.

Sectional input control makes possible four baking zones of varying temperature. Thus, 100 per cent heat can be applied in the first section to raise part temperature quickly, then lower wattage in the latter sections does most of the drying.

Plant saves valuable floor space through the use of this overhead drying oven

Added safety is obtained through concealment of all 15 circuits in bus ducts, running the length of the oven and crossing over in one place to point-of-control switches.

The overhead oven cut 5 hrs from the usual 9 needed to heat dry 2,800 units daily. Some 200 square feet of working space has been freed for storage and general purposes.

Contributing also to the company's broadening production picture is a conveyor, that was recently installed. Through its endless flow, degreasing, painting and drying processes become automatically related operations.

Only hands that need touch a part between assembly and packaging stages belong to the two operators who feed and unload the conveyor. *From Electrical Production, published by the Electrical League of Cleveland, Cleveland, Ohio.*

PRODUCTION RESUMED IN 3 DAYS

after $1,000,000 fire at C&D Batteries, Inc.

C & D President, Leon A. Doughty pulls switch to start charging operations.

C & D's block-long plant in Conshohocken, Pa. at the height of the fire, Sunday, November 29.

Despite a $1,000,000 fire that destroyed the main buildings, offices, engineering department, and laboratory of C & D's plant on Sunday, November 29, 1953, production was resumed in three days.

On Tuesday, December 1, space was leased in a nearby plant for setting up new production facilities. On Wednesday, December 2, new batteries that had escaped the fire were being charged on new lines, and grid casting was begun next morning.

The new facilities were in operation on December 10. The salvaged portions of the main plant and the leased facilities were combined to achieve full production by Christmas.

We thank our customers for their patience in bearing with us during delays in shipping, and assure them that the high quality of C & D products is being maintained. *We are deeply grateful to our many friends who have generously given us their kind understanding and support.*

Philadelphia Inquirer Photos

Two Men Seized in Bakery Holdup

Two holdup men were captured by police late last night, within 15 minutes after they robbed a bakery, on Dryrum ave. near Oster st., of $122.

The robbery occurred in Vern's Bakery, at 9718 Dryrum Aven... men ... the place at 10:35 P. M. The younger one held his hand in ... coat pocket ...

Auto Strikes Man Carrying Box

A man carrying a bo... 93rd st. near Dyrram ... shor... afte...

30 M... Stick

PAN... day) (... Korea... refused ... ing to ... resisted ... tion.

It w... home" ... have ... man. ... AW...

W... more ... cans ...

M... B. O... Cor... sio... nc... pa... in ...

... toda... the ... fate ... cont... TA...

E... conf...

A... the ... on ... p...

C&D BATTERIES, INC.

of Conshohocken, Pa.

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

For more facts circle 537 on Reply Card

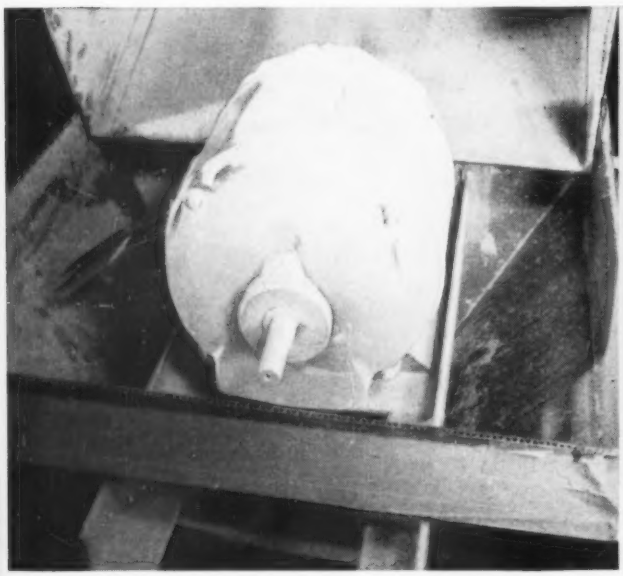
Tests Like This Show The Stamina of R & M "All-Weather"* Motors!

The standard R & M "All-Weather" open motor shown below was placed in a specially built test chamber in which it was blasted with highly abrasive 200-mesh powdered quartz.

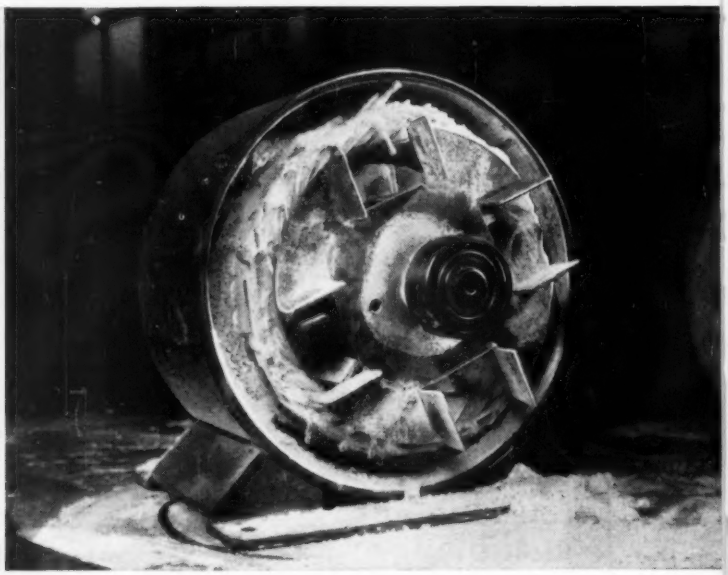
After 2,860 hours continuous operation, it was torn down for examination. In spite of the tremendous amount of quartz deposited by air circulating through the motor, this is what was found: insulation showed no damage; effective thru-ventilation had kept all air-passages clear and unblocked; grease in the fully-sealed pre-lubricated ball bearings was not contaminated—effective bearing seals had kept grease in, abrasive out.

After 8,000 hours in this "snow storm" of quartz the motor is still going strong, even though this accelerated test is subjecting it to treatment that would *never be encountered* in normal applications.

This is the kind of stamina *you can expect* with R & M Motors working for you . . . this is the performance for which R & M "All-Weather" Motors are famous!



This R & M "open" type motor has operated 8066 hours while being blasted with highly abrasive powdered quartz.



Large deposits of quartz were found throughout the motor, yet insulation is sound. bearings are clean.

R&M MAKES THEM ALL!
Explosion-Proof; Totally-Enclosed; Single Phase; Direct Current; Motor Generators; Frequency Converters; Chemical Plant Motors; Close-Coupled Pump Motors; Jet Pump Motors; Motor Parts.

If it's an R&M, it's the Right Motor!

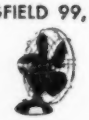
*"All-Weather" is the trademark of Robbins & Myers, Inc.

If you're looking for the one motor with real staying-power—even on the toughest jobs—if expensive "down-time" due to motor failure is costing you money, write for Bulletin 400 *today*. It tells the full "All-Weather" story—shows you the many "extras" R & M offers at *standard prices!* No obligation.

ROBBINS & MYERS, INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

Fractional & Integral h.p. Motors & Generators

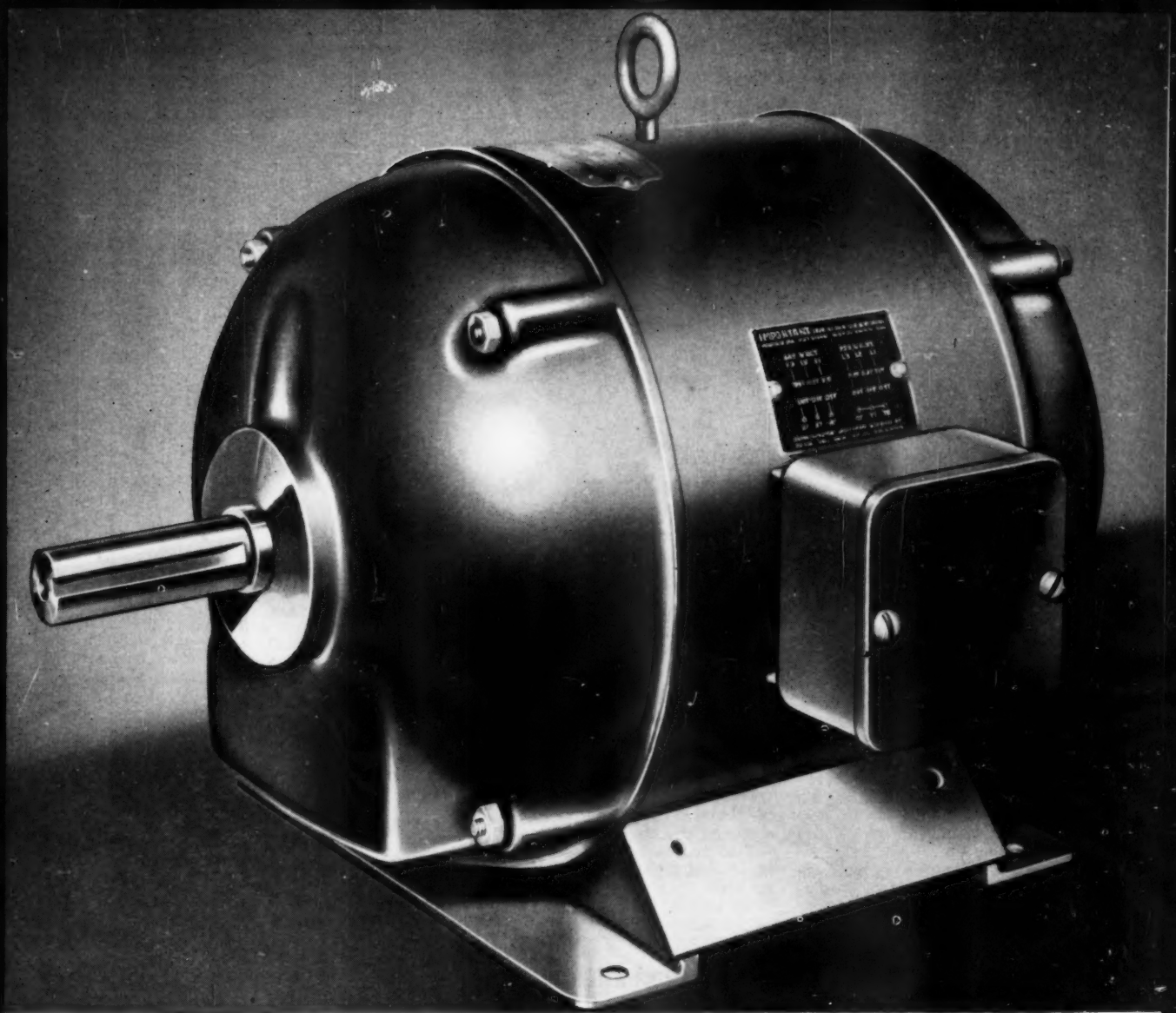


Electric Fans

Electric & Hand Hoists & Cranes

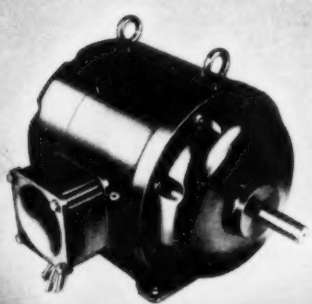
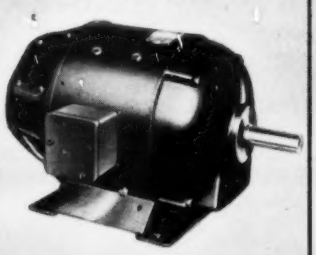
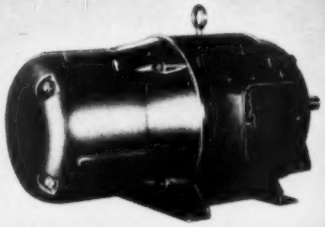
Moyno Pumps

Propellair Industrial Ventilating Equipment



R&M "All-Weather" polyphase motors. 1 to 125 h.p.

1 to 125 h.p. . . . **R&M** has the motor you need!

Explosion-Proof Totally-Enclosed Fan-Cooled, and Chemical Plant Motors, 1 to 40 h.p.	Direct Current 1 to 7½ h.p.	Capacitor Single Phase, 1 to 7½ h.p.	Frequency Converters, 2½ to 15 K.W.
			

Edited by H. E. B. Anderson

Die Cleaning Method Cuts Costs

PRECISION CLEANING of forging and casting dies saves $22,500 per year in cleaning costs and increases die life 15 per cent at the Imperial Brass Mfg. Co., Chicago.

In the manufacture of brass fittings, nozzles, valves, strainers and related products, the company has the constant problem of removing heat scale and carbon deposits from its dies. Slow hand methods were formerly used to remove these deposits, which are caused by forging compounds and oils.

Now in use is a Pangborn Hydro-Finish machine, which speeds the cleaning operation and increases die life. This liquid blast machine cleans with a stream of non-metallic abrasives, which are generally in the talcum powder range, or finer. The company reports a minimum saving in cleaning time of two hours per average-size die and up to three hours for larger and more complicated dies.

Imperial Brass cleans from 25 to 30 dies per day with small dies requiring 5 to 10 minutes and the largest dies from 15 to 20 minutes. One operator spends about 5 hours per day on the job.

The company figures its production savings on the basis of 25 dies per day—at two hours saved per day, they use a saving of 50 hours, or $75.00 per day. Using a 300 work day year, a savings of $22,500 is realized.

Other advantages reported by the company include the reduction of forging troubles, no breakdown of sharp edges and corners and no changes in tolerances in the finished products.

Fork Truck Helps in the Kitchen

TO SOLVE a materials handling problem in the cheese "kitchen" of its Sacramento Avenue plant in Chicago, the Kraft Foods Co. uses two electric lift trucks to handle cheese ingredients in process.

At the plant, the largest cheese producing plant in the world, Kraft uses the trucks to transport wheelbarrow-like bucket trucks filled with blended cheese mixture. The run is from stainless steel hoppers on one side of the room to stainless steel continuous laydown pasteurizers in the center of the room. The trucks are equipped with a specially-designed dumping attachment for dumping the bucket trucks.

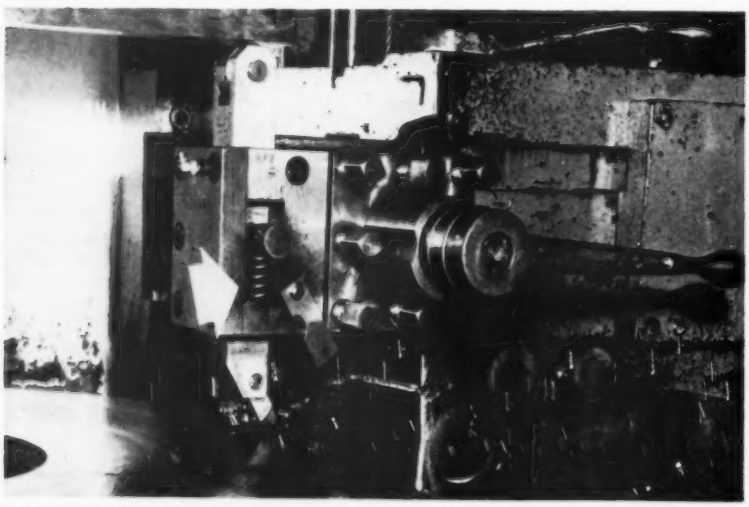
Two trucks serve seven pasteurizers and eight hoppers on a rigid schedule. Drivers move cheese-filled stainless buckets, each weighing 1,000 lb, from the hoppers to the pasteurizers and dump the mixture into the pasteurizers, according to a time cycle dependent upon the cheese mixture recipe.

Photo: Automatic Transportation Co.

Operator driving truck equipped with special lifting arms dumps bucket of blended cheese mixture into pasteurizer

Coil Spring Replaces Cable Linkage on Profile Tool Holder

Contributed by Stanley Sankes, Carborundum Co.



To improve the cutting action on a Bullard vertical lathe, the cable-and-pin tool holding arrangement was removed and replaced with a coil spring set under the pin. The spring provides more positive holding and faster finish cutting

Pipe Benders Cut Costs

Contributed by Wilmer R. Schuh, E. D. Wesley Co.

A 75 PER CENT saving in the cost of materials and labor, a finished installation more efficient in operation, and a streamlined effect that makes beauty of a maze of pipe is not only possible, but a certainty for most average pipe installations, if the pipe is bent.

These advantages were obtained through the use of pipe benders on much of 22,074 ft of pipe work our company recently completed on the erection of four oil storage tanks on Jones Island in Milwaukee, Wis.

Most of the work consisted of connecting foam lines, for fire prevention, from a foam house to four storage tanks.

Our pipe bending operations were concentrated on 10,020 ft of 4-in. pipe and 3, 983 ft of 3-in. pipe. In addition, pipe benders were used on 1,234 ft of 4-in. product line for loading tank cars and on 380 ft of 2-in. product lines.

In all, we made 135 bends and 32 offsets at a saving in materials worth more than $800.00, plus 270 hours in time and labor costs.

Use of bent pipe creates another saving, in that its salvage rate is practically 100 per cent.

Add to the above savings the further value of unlimited direction and the offsets which can be made.

Full advantages of bent pipe are

meet the man who

Predetermines Performance of MARLEY COOLING TOWERS

He is Donald R. Baker, who directs Marley cooling tower performance-research and testing. Mr. Baker and his staff of associate engineers have changed the standard of measurement for cooling tower rating from a yardstick to a micrometer. Their achievements offer a very tangible benefit to every Marley customer: the assurance that all Marley cooling towers will meet or surpass specified design performance.

Positive predetermination of cooling tower performance is the result of more than a decade of effort by this Marley research group. The project has required the cumulative knowledge of many specialized engineering skills possessed by members of this department. Their approach has been both scientific and practical. Every theory developed has been proven in the Marley cooling tower test plant—industry's first and always the most complete installation of its type. Services of independent research and test organizations have been used liberally to further prove the practicality of every effort.

The published results of Marley test research are available through Marley engineering sales offices in 50 cities. Just ask for Technical Bulletin R-52-P10.

Other Marley research projects: WOOD DETERIORATION AND PRESERVATION, CORROSION OF METAL, PROTECTIVE COATINGS, METALLURGY, LUBRICATION AND OTHER OPERATIONAL PROBLEMS, MATERIALS SELECTION. Literature or information available on all subjects.

The Marley Company

Kansas City, Mo.

For more facts circle 539 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 50)

realized when the bending is done at the job and the proper pipe benders are utilized. It is possible to buy pipe already bent, but the cost of bending is considerably higher than if it is done at the job.

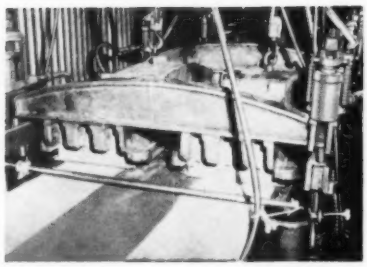
We used the Tal one-shot bender, made by Tal Bender, Inc., which has a long ram, makes use of half circle shoes instead of short formers, and has a bend indicator. We found that the bends could be made with consistently good fit and continued similarity.

The efficiency of the installation is still another phase where bends prove their superiority. The smooth walls allow a flow with lower resistance and decreased turbulence.

Hydraulic Rams Help Vulcanize

REPAIRS to conveyor belts in one of the world's largest iron mines, where belt lengths run as high as 3 miles, are constantly recurring operations. A special building has been erected for renewing conveyor belt surfaces.

To maintain pressure on the vulcanizing platen used in the belt repair, an unusual arrangement of hydraulic rams, using Owatonna 30-ton center-hole rams, has been adopted. Two vulcanizing platens are used throughout the winter season (when mining operations are suspended) to repair all belts. Four rams, one on each corner of the platen, are used in the process. All four rams on each platen are connected to the pump in series, so equal pressure is exerted by each ram.



Hydraulic rams put pressure on vulcanizing platen to assure uniformity

Save Dollars by Saving Swarf

THE DESIRABILITY of segregating diamond swarf from other grinding swarf is undisputed. Where a job requires the use of diamond wheels exclusively, it is not difficult to keep the swarf separate. By installing suitable dust exhausters, all the swarf from these machines can be accumulated for reclaiming. This swarf is usually of a very good grade and practically all the diamond can be readily reclaimed.

However, when a machine is used for grinding with diamond, aluminum oxide and silicon carbide abrasive wheels at different times, it is very important that whenever the diamond wheel is in use, the swarf is kept separate from other swarf. If not, it will be diluted with other abrasive dust to the extent that reclaiming will not be feasible.

Dust collector fines taken from a unit serving all grinding operations in a department or plant have proved to be unsatisfactory for reclaiming. This material generally contains less than one carat of diamond per pound of swarf and as such is uneconomical to process.

R. H. Hunter, of Diamond Products Div., Norton Company, has outlined the following procedures for collecting diamond swarf for economic reclamation of the diamonds.

Dry Grinding

If the machine used for diamond wheel grinding only is serviced by a central exhaust system, a filter can be installed in the duct, close to the machine. This filter can be made of spun glass, several layers of wire mesh, cloth, paper or any of several materials that will allow air to pass through and yet hold the diamond particles.

The central exhaust system can also be used provided a by-pass is installed in the line near the machine. This by-pass causes the diamond swarf to be routed through filters or screens. When using an aluminum oxide or silicon carbide abrasive wheel the damper is turned in the other direction so that the unwanted swarf passes up through the duct into the regular dust collector.

A separate dust collector for diamond wheels, either portable or stationary, can be used. There are several small units available employing paper or cloth bags, filters, or electrostatic separators. Usually, these machines are equipped with a flexible duct and the opening can

Maintenance Cart Carries Flooring Repair Tools and Materials to Distant Repair Jobs

Contributed by Herman Goelz
Allis-Chalmers Manufacturing Co.

MOST RECENT USE for the mobile maintenance cart has been found in our floor covering repair work. Repairs to the linoleum and tile floors in the main office building often involved traveling considerable distances from the shop.

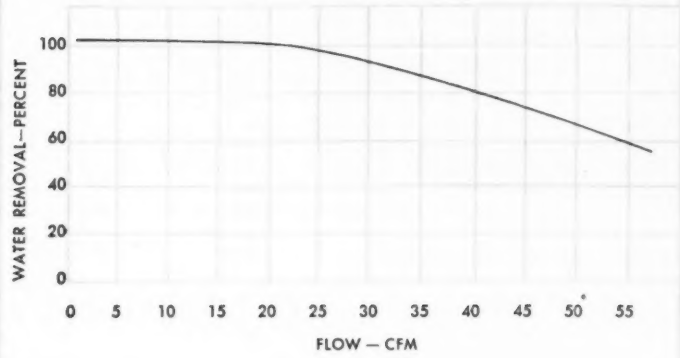
To carry the necessary materials to make the repairs, a cart was designed and built in the shop. Of wooden construction, it is 25 in. wide, 28 in. high and 42 in. long. A lower compartment on either side holds 5-gallon buckets of paste, sand bags and floor conditioning material. The upper portion of the cart is divided into two compartments with hinged covers to store brushes, paste application and carpenter tools.

The cart has been instrumental in saving many man hours per year by making it possible for the maintenance people to have all the necessary equipment as needed on jobs, many of which are in widely separated areas in the building.

Mobile cart carries floor repairing materials to the job. Compartmented construction provides ample storage space with ready access to materials and tools

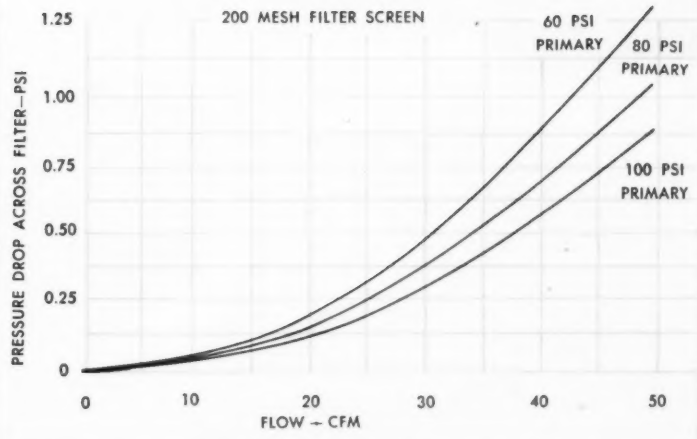
PERFORMANCE DATA PROVE
Norgren Automatic-Drain Filter's

HIGH EFFICIENCY IN MOISTURE REMOVAL



operates whether air pressure is constant or fluctuating, whether or not air is flowing.

LOW PRESSURE DROP



Filtering the air that powers your tools, cylinders and other pneumatic equipment is essential if you want better equipment performance and more output with lowest maintenance costs.

The new transparent bowl Norgren Automatic-Drain Filter gives you this vital protection automatically, whether air pressure is constant or fluctuating, whether or not air is flowing...assures clean, dry air under all conditions, without attention. Flow: 0 to 35 cfm; pressure; 30 to 150 psi; temperature: 40° to 120° F.

Drain operates automatically, but discharges only under full load to reduce wear and loss of air.

WRITE FOR NEW CATALOG No. 600

C. A. Norgren CO.
3443 So. Elati, Englewood, Colo.

PIONEER AND LEADER IN OIL-FOG LUBRICATION FOR 26 YEARS

Valves • Filters • Regulators • Lubricators • Hose Assemblies

New transparent replaceable bowl filter for ¾" and 1" air lines. Water capacity 1 pint.

Replaceable metal bowl filter for ¼", ⅜" and ½" air lines.

Permanent metal bowl filter types for ¼" to 1½" air lines.

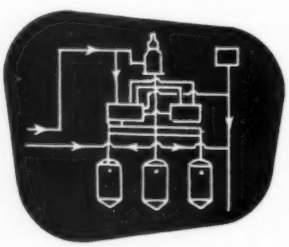
New, small replaceable bowl filter for ¼" and ⅜" air lines. Screw type clamp ring.

For more facts circle 540 on Reply Card

How to select a PROTECTIVE COATING

CHECK RESISTANCE TO CORROSIVE MEDIA

How well a coating withstands the action of a given corrosive agent is the first factor you must necessarily consider in choosing the right coating for your needs — but it's *only* the first.



CHECK ADAPTABILITY TO SERVICE CONDITIONS

The second factor — and one you can't always predetermine by laboratory test — is on-the-job performance. That's governed, in turn, by the kind of metal you're protecting . . . the condition of the surfaces . . . how the equipment is constructed . . . conditions encountered during its operating cycle . . . during idle periods — considerations that must be surveyed in detail before you can select a protective coating with reasonable assurance it will successfully meet your requirements.

Dampney equipment-engineered coatings give you that assurance because they are formulated to do certain selective, specialized jobs both large and small, difficult and routine — to give you the protection that is right for you — not in a costly, custom-made material nor an all-purpose anti-corrosive, but in a coating *engineered for the equipment it is to protect.*

Dampney's industrial equipment knowledge is yours to call upon freely. Let us put it to work on your next coating problem.

MAINTENANCE FOR METAL

THE DAMPNEY COMPANY

BOSTON 36, MASSACHUSETTS

140-1

For more facts circle 541 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 50)

be placed in the position required to draw off the swarf.

This type of installation has proven its value in small plants where diamond wheel grinding is done at various machines but not simultaneously, and also where machines with several different types of abrasive wheels are used. When a diamond wheel is used, the portable collector is rolled to the machine to collect the diamond swarf. When any other type of abrasive wheel is used, the regular exhaust system is employed.

Moist or Wick Grinding

The collection of diamond swarf from these "moist" grinding operations is similar to that of collecting dry swarf, since in most cases there is not enough moisture present to flow the swarf into tanks. One type of swarf exhauster and collector designed especially for diamond wheel grinding embodies a suction pump and applies the coolant to the wheel as well as collecting the swarf.

Wet Grinding

If diamond wheels are used exclusively on a wet machine, it is a simple matter to collect the swarf or sludge. However, it should be allowed to stand at least a few days before pouring off the water or other coolant. Diamonds are far lighter than the carbides and require a longer time to separate.

If the machine is used for grinding with other than diamond wheels, the diamond swarf can be collected by using a separate reservoir or tank when grinding with diamond wheels, or attaching a bag, filter or other swarf-retaining apparatus to the end of the exhaust duct. The water passes through the filters back into the tank.

The collection of diamond swarf insures reduced grinding costs and helps to cut down delivery dates of diamond wheels considerably. It means that diamond is being utilized effectively but not wasted. In many cases where diamond wheels are required on short notice, they are almost immediately available because of the diamond reclaimed from swarf.

Barrels Tested for Stacking

Contributed by C. T. Baker

TO DETERMINE the "stacking strength" of wooden barrels used in a cold storage warehouse, tests were run on two typical barrels.

The first barrel was filled to within two gallons of full and then subjected to a load of 10,000 lb. while standing on end. The barrel was supported on two lengths of 2 by 4 lumber, laid flat; three lengths of

Confidence...

A STATE OF MIND THAT

GOES WITH **J&L WIRE-ROPE**

CONFIDENCE IN Quality

because J&L stands for:

1. Quality-tested steel wire
2. Uniform fabrication of strands
3. Wires and strands in perfect balance
4. Special lubrication of strands
5. Accurate construction (true to round)
6. Resistance to bending fatigue

CONFIDENCE IN Service

because you can depend upon
J&L Distributors and Sales Offices for:

1. Quick, efficient delivery
2. Complete stocks near at hand
3. The right rope for every job
4. Technical service by
   Wire Rope specialists

JONES & LAUGHLIN STEEL CORPORATION
Pittsburgh

J&L STEEL

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NEOPRENE

coatings and linings

PROTECTION

against corrosive fumes or immersion

APPLIED

by roller, brush or spray

LIKE PAINT!

Gaco LIQUID NEOPRENE PROTECTIVE COATINGS

N-700

General Maintenance Coating for protection against corrosive fumes and splash. Air Curing—No Heat.

N-200-1

Heavy Duty Lining for tanks and equipment—for constant contact and immersion. Heat Curing.

Send me the facts about this genuine Neoprene Corrosion Protection that goes on like paint at **LOWER APPLIED COST and OUTLASTS ALL OTHER COATINGS.**

Name_____

Company_____

Address_____

Send this coupon to

GATES ENGINEERING COMPANY

P. O. Box 1711, Wilmington, Delaware

For more facts circle 543 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 50)

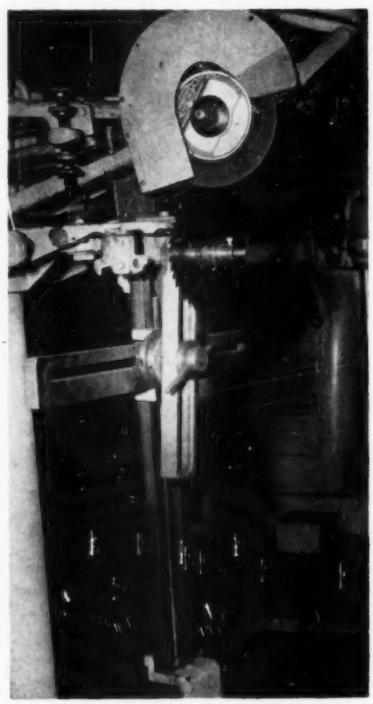
the same 2 by 4 lumber were laid across the top of the barrel and a heavy timber was placed across these, at right angles. The load was impressed on the heavy timber. No leakage was observed nor was there any sign of weakness in the barrel.

The second barrel was similarly filled, supported and loaded. This barrel, not as sound as the first, showed slight initial leakage before the load was applied. Very slight increase in leakage occurred when the load was applied, but 48 hours' soaking swelled the barrel sufficiently to stop leakage. A second loading test, this time under 12,000 lb, showed the barrel sound.

Based on these tests, with a net weight average of 350 to 375 lb of stored product, it was deemed safe to stack the barrels 15 tiers without danger of the lower tiers collapsing.

Jig Increases Range of Saw Blade Sharpener

ADAPTATION of a saw blade gumming machine has increased its service range to cover saw blades up to 40 in. in diameter. Formerly limited in capacity to blades from 12 to 30 in. diameter, the machine modification devised by N. A. Dobvish of the Long Beach Naval Shipyard



Saw blade in position on modified gumming machine. Jig holds varying sizes

Miller AIR CYLINDERS

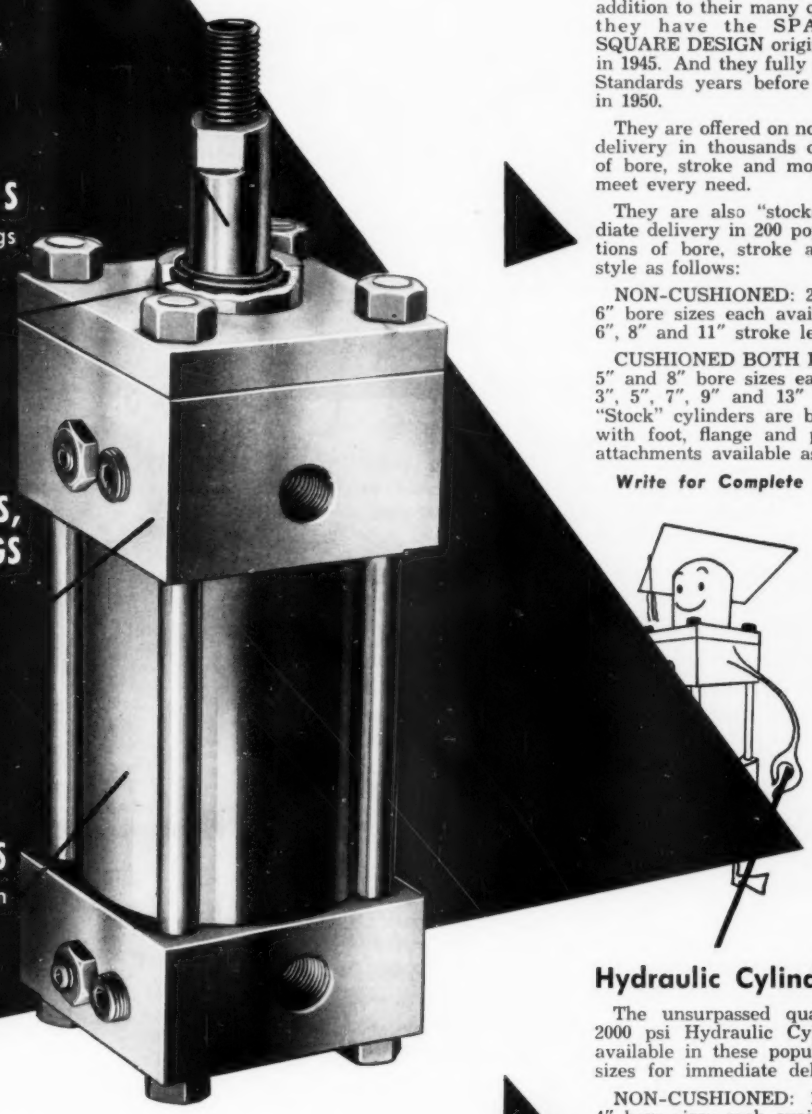
Reduce Maintenance and Lost Production Time

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

BRASS BARRELS
Eliminate Rust and Corrosion



Miller Air Cylinders are renowned for longest service life with near-zero maintenance in heavy duty service. In addition to their many quality features, they have the SPACE-SAVING SQUARE DESIGN originated by Miller in 1945. And they fully met the J. I. C. Standards years before their adoption in 1950.

They are offered on normal scheduled delivery in thousands of combinations of bore, stroke and mounting style to meet every need.

They are also "stocked" for immediate delivery in 200 popular combinations of bore, stroke and mounting style as follows:

NON-CUSHIONED: 2", 2½", 4", and 6" bore sizes each available in 2", 4", 6", 8" and 11" stroke lengths.

CUSHIONED BOTH ENDS: 2", 3¼", 5" and 8" bore sizes each available in 3", 5", 7", 9" and 13" stroke lengths. "Stock" cylinders are base Model A53 with foot, flange and pivot mounting attachments available as desired.

Write for Complete "Stock" List

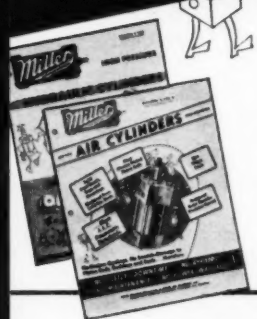
Hydraulic Cylinders, Too!

The unsurpassed quality of Miller 2000 psi Hydraulic Cylinders is now available in these popular models and sizes for immediate delivery.

NON-CUSHIONED: 1½", 2½", and 4" bore sizes each available in 2", 4", 6", 8" and 11" stroke lengths.

CUSHIONED BOTH ENDS: 2" and 3¼" bore sizes each available in 3", 5", 7", 9" and 13" stroke lengths.

Cylinders are base Model H53—with foot, flange and pivot mounting attachments available as desired. *Write for list.*



WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR COMPANY

2011 N. HAWTHORNE AVE. • MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

*Trade Mark. Patent No. 2463199.
DUALOC means dual lock. Two steel collars securely swaged around the ending double your security. Don't distort rope. Give full rope strength. Warranted by ACCO.

● Now you can buy ACCO *Registered* standard stock parts from which you can make infinite combinations of wire rope slings. If a new lifting job develops, you most likely can handle it with a different hook-up of the same standard ACCO *Registered* parts you use for regular lifts. But if you should need longer legs, or heavier legs, that's no problem either because everything you need is . . .

Stocked by Distributors

● ACCO *Registered* Wire Rope Slings and Fittings are stocked by ACCO Sling distributors. That means you can get quick service if you need additional parts, or if some part should become damaged. In case of damage, you don't send a "special" sling back for repairs. (You know how long that takes.) You just order a replacement part from your distributor who delivers promptly.

ACCO offers you a complete line of links, safety shackles, and hooks. These items are all *Registered* and *Warranted* to have the same strength and dependability as the slings they are to be used with.

Find Out Now *what you can do with ACCO Registered Wire Rope Slings. See your ACCO Sling distributor or write our Wilkes-Barre, Pa., office for literature.*

ACCO
WIRE ROPE SLING DEPARTMENT
AMERICAN CHAIN & CABLE
TRADE MARK
Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ontario

ACCO Registered Wire Rope Slings

For more facts circle 545 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 50)

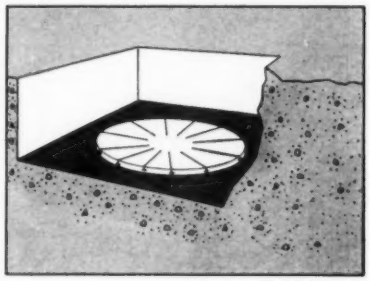
has removed the limitation. Now equipped with an adjustable blade-holding jig, the machine will service blades from the smallest up to those 40 in. in diameter.

Work Table for Erection Pit

Contributed by Thomas Manning
Allis-Chalmers Manufacturing Co.

INSTALLATION of a surplus boring mill table on the floor of an erection pit has increased the effectiveness of the work done on Allis-Chalmers' erection floor.

Leveled and anchored into the pit



Cutaway view of erection pit shows installation of boring mill table in pit

floor, the table has facilitated such work as stacking turbine spindles, aligning large shafts, boring and reaming holes in the couplings of large shafts, and shrinking in large gas engine cylinder liners.

Work mounted on the table requires little or no leveling, and the T-slots in the table make it unnecessary to drill and lead in hold-down and clamping bolts.

Tongue and Groove Flooring Improves Platform Strength

Contributed by Bert Fielding
The Carborundum Company

ONE TYPE OF PLATFORM used by our company to store and carry materials consists of a 4-legged angle iron frame, floored with wooden planks. The planks were formerly held in place by bolting them to the iron frame, one or two bolts to each end of a plank. This concentration of holding force often resulted in the planks being ripped off the frame when the platform was subjected to severe handling. The planks split at the bolt heads, and quite frequently the bolts were bent as the planks tore loose.

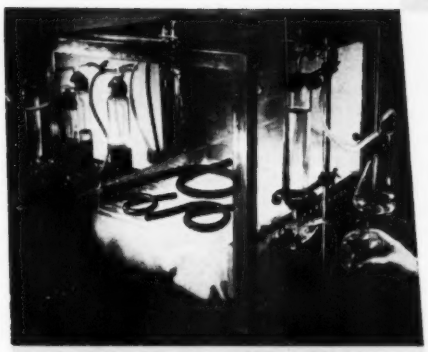
Adoption of a tongue and groove fastening of the planks has greatly reduced the repairs formerly required to keep the platforms in good working order.

In the new construction, a full

4 AWG Stranded 3/C RoZone insulated, shielded, RoPrene sheathed power cable, 5000 Volts.

Rome RoZone®

Superior Ozone-Resistant Insulation Deserves Your CONFIDENCE



How Rome Cable Tests Ozone Cutting
Ozone resistance of insulating compounds is determined in an ozonizer. Specimens are subjected to ozone atmosphere of prescribed concentration. To see what happens note specimens below.

What Ozone Does to Cable Insulation

Unretouched photo of conventional rubber specimen after short-time ozone test.

Unretouched photo of RoZone specimen after long-time ozone test.

What Its High Ozone Resistance Means to You

Q: What is ozone?

A: Ozone is activated oxygen, a gas resulting from corona discharge, a phenomenon which may occur in the distribution and generation of high voltage electricity.

Q: How does it affect cable insulation?

A: Ozone, an enemy of conventional rubber compounds, causes accelerated cracking and embrittlement of cable insulation. The result . . . early cable failure.

Q: What does RoZone's high resistance to ozone mean to you?

A: First and most important, it protects you against cable failure due to ozone cutting . . . assures you of long-time dependability of service. With the power and control cables amounting to as little as 1 or 2 per cent of total generating station investment, you cannot afford to risk shut down of facilities by sacrificing insulation quality.

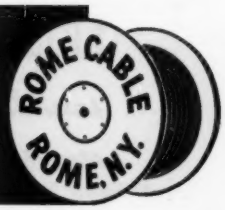
Further, RoZone is a type of insulation which has behind it better than 75 years of dependable performance. By independent laboratory tests, it exceeds all industry specification requirements.

While ozone cutting is a natural hazard of high voltages, low voltage failure is often traced to ozone cutting because of adjacency to rotating equipment or high voltage lines. RoZone, therefore, is your best protection *regardless of voltage classification.*

Approved by the country's leading consulting engineers for its well-balanced properties, RoZone merits your confidence for all high and low voltage work where dependable, long service life is paramount. We will be glad to send independent test data upon request.

RoZone is approved and accepted by leading utilities, industrials and consulting engineers.

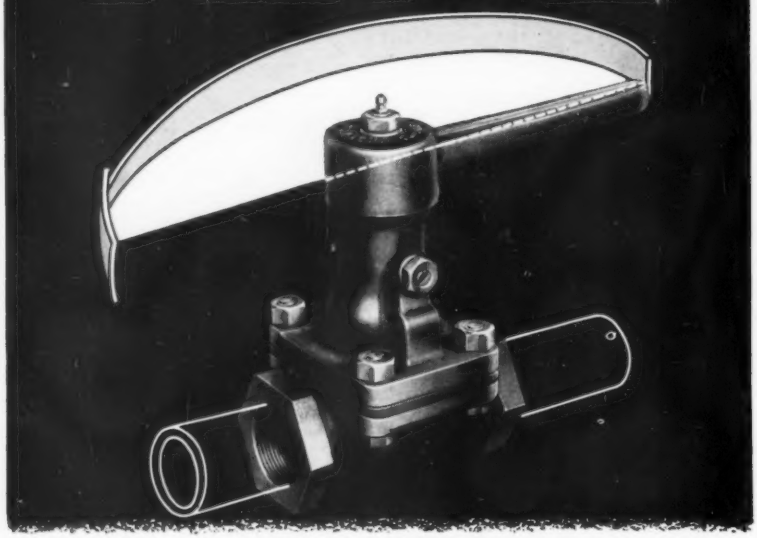
ROME CABLE
Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA



For more facts circle 546 on Reply Card

with this corrosion resistant valve . . .

YOU GO FROM FULL OPEN TO FULL CLOSED IN A 180° SWING OF THE LEVER



HILLS-McCANNA

Quick Opening

SAUNDERS PATENT DIAPHRAGM VALVES

Where you must combine the ability to handle tough services with quick opening—quick closing characteristics, Hills-McCanna Lever operated Diaphragm Valves are the answer. The lever action is smooth and positive. An adjustment for holding the handle in an intermediate position provides throttling when required. Available with choice of fifteen diaghragm materials including rubber, neoprene, polyethylene, Kel-F and Teflon. Choice of over fifty body materials that include rubber, glass, lead, and plastic linings, any machinable alloy and plastics. Dependent upon materials and size, Hills-McCanna Saunders Patent Valves are suitable for temperatures to 400°F., pressures to 150 psi. Write for descriptive literature. HILLS-McCANNA CO., 2450 W. Nelson St., Chicago 18, Illinois.

HILLS-McCANNA

saunders patent diaphragm valves

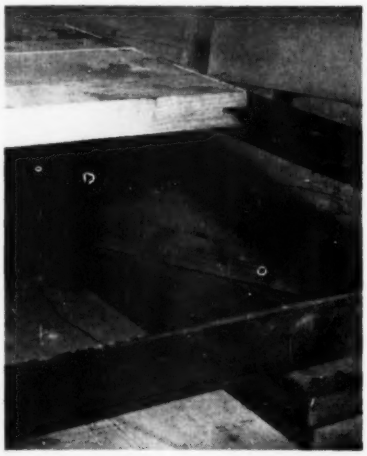
Also Manufacturers of Proportioning Pumps

Force Feed Lubricators Magnesium Alloy Sand Castings

For more facts circle 547 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 50)



Platform partially floored shows tongue-and-groove method of installing planks

length tongue of flat stock is welded to one side of the angle iron frame, while a tongue that is one plank width shorter than the frame is welded to the opposite side. Grooves cut in the ends of the planks fit over these tongues. The last plank inserted when making up a platform is held in place by one bolt, positioned behind one of the angle iron legs. In this position the possibility of its being struck by a lift truck is slight, with a resultant decrease in damage.

Craneway Traffic Lights

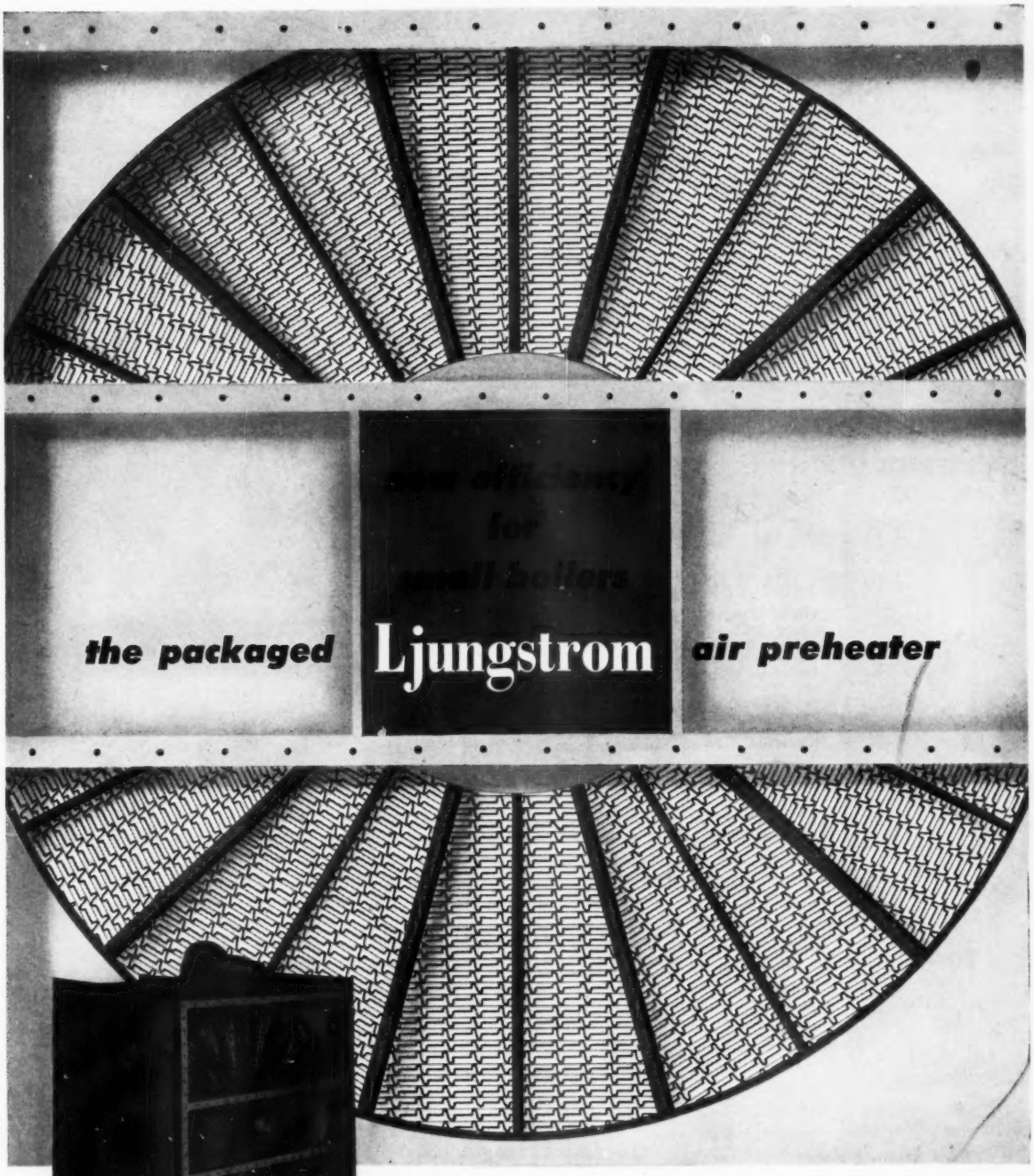
RED TRAFFIC LIGHTS flash a warning at Standard Pressed Steel Co.'s plant in Jenkintown, Pa., whenever the overhead crane approaches any one of three heavily traveled cross-aisles.

To prevent a load from falling on an unwary passerby, sets of photo-electric eyes keep watch over each cross-aisle. These eyes are connected to blinker type warning lights, one suspended 12 ft above each intersection.

When a crane comes to within 20 ft of the centerline of an aisle, it interrupts a photo-electric beam. The red lights in the "danger" aisle immediately start blinking and continue to flash their warning until the overhead crane has safely passed.

The new warning system, constructed in the plant, cost less than $250 per aisle—the cost of the photo-cell units, the traffic light and the necessary controls and wiring.

The protected craneway—in which SPS stores steel bar and coil stock to be made into screws and locknuts—extends for 335 ft through the receiving end of the plant. The three cross aisles are each 10 ft wide.



Even boilers as small as 25,000 pounds of steam per hour — can now operate at fuel efficiencies you never dreamed of. With the new *Packaged Ljungstrom*, you can apply the principles of heat recovery universally used in large utilities. The Packaged Ljungstrom Air Preheater operates on the *continuous regenerative counterflow* principle. Waste heat in products of combustion is absorbed on specially designed surfaces in the slowly rotating rotor. As the surfaces enter the stream of incoming combustion air, they transfer their heat to this air. The entire unit is self-contained as you receive it. For more detailed information – get in touch today with The Air Preheater Corporation.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

For more facts circle 548 on Reply Card

P&H Zip-Lift Electric Hoist (Pushbutton control)

Handy little power-house for loads from 250 pounds up to one ton. Versatile — in use in metal shops, dairies, hospitals, bakeries. Solves your load-handling problem within the weight limits specified. Literature is available for more detailed information. Ask for it.

P&H Zip-Lift Electric Hoist (Rope-control model)

You can do anything with this model that you can with the Pushbutton Control Zip-Lift. The less expensive rope-control gives you a break on price — doesn't cut down the number of jobs you can perform. You get years of trouble-free service at an extremely reasonable initial cash outlay.

P&H Chain Hoists

Perhaps you're in the market for a chain hoist; rather than wire-rope. If you are, you'll have to look far to find a better value than these P&H work-horses. Handle up to 25 tons easy as pie. Spur-geared; Timken or roller bearing trolleys; Army-type trolleys — whatever you need. Ask for literature on the complete line.

P&H Jib Cranes

Hang your hoist on a P&H Jib Crane — then you've got a dependable one-two combination working for you. Eight different models — bracket-type, mast-type and pillar-type. Capacities up to 12,000 pounds. Use the coupon for fast return of literature on the complete P&H Line.

P&H Hevi-Lift

For heavy loads — and your own particular problem. The Hevi-Lift is a custom-built hoist —manufactured to your specifications. Over 3,000,000 variations possible on this husky load-handler. You're sure to find the right combination for you. Take a look at the literature available — then see your P&H distributor for a concrete solution.

Here's the big news in hoists for 1954

Now — Look what you get from P&H

1. *A greatly augmented product line — complete selection for your needs*
2. *Mechanical superiority that lets you work with confidence and profit*
3. *25% overload safety factor on every P&H Hoist you use*

REMEMBER the dependable service you've been getting from the P&H standbys? The quick, push-'em-around action from the P&H Pushbutton Zip-Lift; and the husky-muscle load-handling from the P&H Hevi-Lift?

Now you can get that same dependable service from a greatly augmented P&H Hoist Line — a line that gives you a selection of practically every kind of hoist service you need.

What's been added? Well, there's the Rope Control Zip-Lift, for instance. Same maneuverability; same light, quick touch that solves your load-handling problems. And, best of all — the Rope Control lifts dollars off the price of this model. You save on the initial purchase price — and you save for years afterward — in increased speed and flexibility on your production line.

But that's not all . . .

Next there's the new P&H Line of Chain Hoists. For spots where the work problem demands a chain hoist — you get a complete selection from P&H. All kinds available — spur-geared; army-type trolley; low-headroom trolley — and in capacities up to 25 tons.

Need a jib crane? P&H supplies them too. Eight different models — bracket-type, mast-type and pillar-type. Reaches from 8 to 20 feet — capacities up to 12,000 pounds.

Yes, P&H gives you *complete* coverage in your hoist service. Every new model built with the painstaking care and meticulous attention to detail you've come to expect from P&H.

Each hoist is guaranteed to withstand an occasional overload of 25% more than its rated capacity. Take a look at the illustrated line and use the coupon below — today.

This coupon and a 3¢ stamp gets you complete information on the P&H Hoist Line.

P&H HOISTS

HARNISCHFEGER CORPORATION

4696 W. National Ave. • Milwaukee 46, Wis.

TEAR OUT COUPON AND MAIL TODAY!

P&H Hoists
HARNISCHFEGER CORPORATION
4696 West National Avenue, Milwaukee 46, Wisconsin

I'd like to know more about the P&H complete line. I'm particularly interested in — Pushbutton Zip-Lift ☐; Rope-Control Zip-Lift ☐; Hevi-Lift ☐; Chain Hoists ☐; Jib Cranes ☐. Send the dope to:

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

Maintenance free Design

Allen-Bradley starters have silver alloy contacts which never need cleaning or filing

● Freedom from contact maintenance is a desirable feature in any motor starter and especially in controls having the cover of the enclosure bolted to the base. That is why so many electricians and plant engineers specify Allen-Bradley motor controls. All Allen-Bradley controls are equipped with double break, silver alloy contacts which will operate for months . . . and even years . . . without requiring even contact inspection.

They also know that the simplicity of Allen-Bradley starters means freedom from trouble . . . hence, freedom from production stoppages.

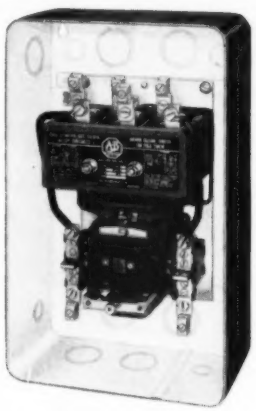
You cannot make a mistake when you specify Allen-Bradley control.

Allen-Bradley Co.
1317 S. First St., Milwaukee 4, Wis.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

A-B Quality

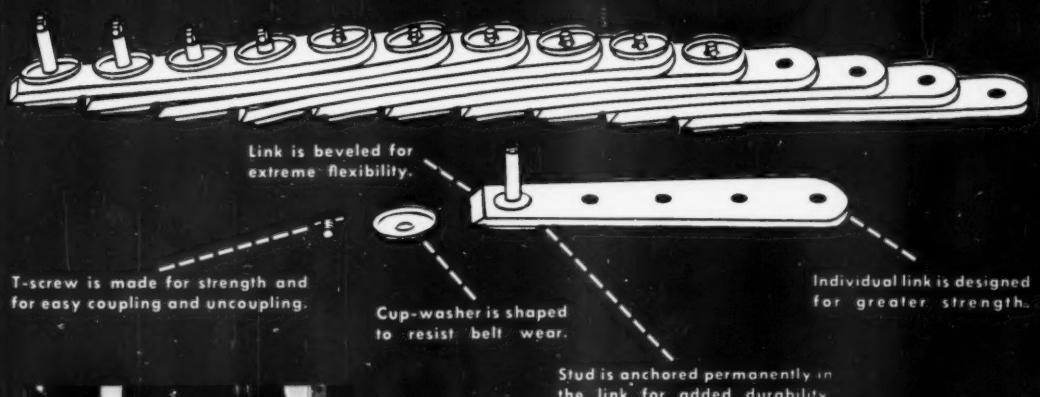
The Sign of *Quality* Motor Control

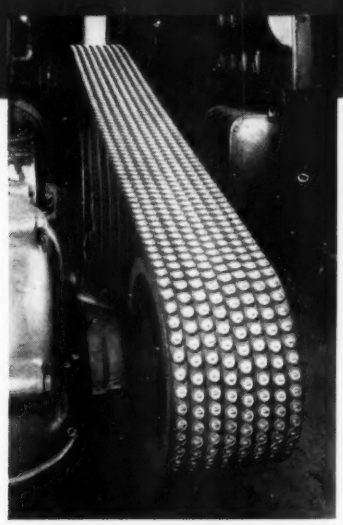


Bulletin 709, Size 3 Solenoid Starter. Maximum Rating: 30 hp, 220 volts; 50 hp, 440-550 volts.

For more facts circle 550 on Reply Card

This detailed line drawing of the new, patented Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job . . . easier!


Link is beveled for extreme flexibility.
T-screw is made for strength and for easy coupling and uncoupling.
Cup-washer is shaped to resist belt wear.
Stud is anchored permanently in the link for added durability
Individual link is designed for greater strength.



New VEELOS

TD and TE Adjustable V-belt

So easy to couple *it installs in minutes*

So strong and durable *it lasts for years*

The new Veelos TD and TE adjustable v-belt is the successful development of a specific v-belt designed for a specific service—D and E drives.

This new Veelos TD and TE v-belt has these basic advantages . . .

It simplifies installation. Links are quickly joined by easy-to-use cup-washers and T-screws to make up individual belts. It's the easiest v-belt to couple and uncouple ever developed. And you don't need to waste time removing outboard bearings.

It lasts longer—is more flexible. New high-tensile strength link combined with new stud, cup-washer, and T-screw gives added durability. New link construction provides maximum flexibility for cooler, wear-resistant running.

Get the complete story of this great new v-belt for D and E drives. Send coupon now for new 8-page illustrated catalog.

VEELOS
THE LINK
V-BELT

Veelos is known as Veelink outside the United States.

MANHEIM MANUFACTURING & BELTING CO.
652 Manbel St., Manheim, Pa.

Please send copy of your new Veelos TD and TE v-belt catalog.

Name .....

Company .....

Address .....

.....

207

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

For more facts circle 551 on Reply Card

Here's the

BIG TRUTH*

about boilers

***The only safe way to select boilers is on nominal capacity to operate at "cruising speed"...**

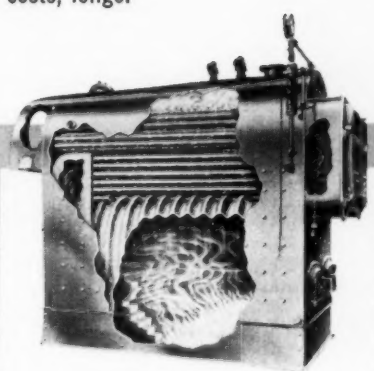
KEWANEE reserve plus rating

guarantees dependability, higher efficiency, lower costs, longer life—because it means "cruising speed" operation.

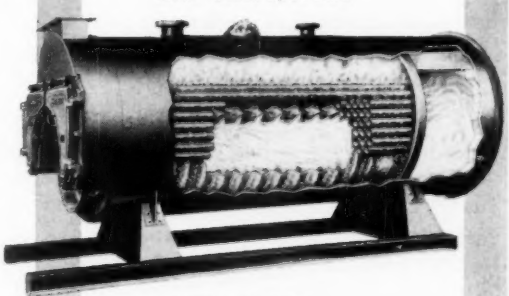
■ There's a lot of confusion in sizing boilers today because rating methods have not been brought into the open with a clear-cut definition. That's all changed with Kewanee Reserve Plus Rating. Here for the first time these truths are stated: Only nominal-rated boilers with built-in reserve *safely provide* efficiency—low maintenance—dependability—longer life. Only nominal-rated boilers *safely provide* for fluctuating loads—emergencies—expansion.

So when you consider "bidding data" be sure you compare like examples . . . know whether ratings are based on maximum capacity or nominal capacity.

Follow the Kewanee Reserve Plus Rating Plan which is based on the commercial code of the Steel Boiler Institute. Kewanee Reserve Plus certifies 50% or more extra power for pick-up and additional capacity. Kewanee gives you complete data and dimensions, so you can realistically consider sizing requirements.



Kewanee type "C" boiler
with exclusive corrugated crown sheet
16 sizes for oil, gas or stoker
3650—42500 sq. ft. steam
5840—68000 sq. ft. water



M-800 series boiler

Here is the rugged "M-800" Series Scotch Boiler constructed in 13 sizes for high pressure steam 39 to 304 horse power and low pressure 15 lb. steam or 15 lb. water.

You can count on* KEWANEE *engineering

KEWANEE-ROSS CORPORATION • KEWANEE, ILL.
Division of American Radiator & Standard Sanitary Corporation

Serving home and industry • American-Standard • American Blower • Church Seats & Wall Tile
Detroit Controls • Kewanee Boilers • Ross Exchangers • Sunbeam Air Conditioners

KEWANEE BOILERS

For more facts circle 552 on Reply Card

MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Simple file test proves proper swivel bearing hardness

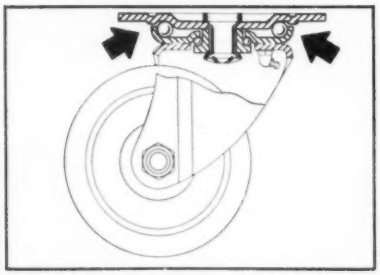
Hard? Filing action fails to cut uniformly hard (15N90 Rockwell) bearing raceway surface — showing you get *more-for-the-money* service life when you specify Bassick double ball-bearing cold-formed steel casters.

File-hard bearing surfaces

Bassick's deep full case-hardening process employs Leeds & Northrup electrically controlled "Homocarb" furnaces to assure "file-hard" ball and raceway surfaces of uniform depth and value of hardness. This eliminates premature wear or failure of these vital swivel bearing parts of all cold-formed double ball-bearing steel casters.

Try this simple file test in comparing the caster you are now using with a Bassick cold-formed double ball-bearing steel caster (series H99, S99, 68, H68, etc.). More-for-the-money service life is assured since Bassick's "file-hard" bearing surfaces are highly resistant to wear or damage.

Cross-section shows location of case-hardened parts



All surfaces of swivel bearing parts are full case-hardened *all over* — note heavy lines. Unlike so-called "coin-hardening" or its synonym "work-hardening", which reflects only a change in metal density as a by-product of cold forming metal processes, Bassick's controlled hardening process after forming provides completely uniform hardness depth and "file-hard" (15N90 Rockwell hardness) surface value.

Full case-hardened and cupped raceways give you longer service

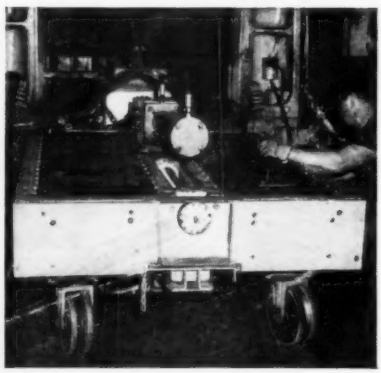
On light-duty trucks and dollies, series "68" caster gives easy action. Load ratings up to 800 lbs. per truck.

Shop trucks and mobile equipment move easier on new low-cost series "H68" caster for loads up to 1400 lbs.

For medium and light-duty jobs, use rugged series "H99" caster with load ratings up to 4000 lbs. per truck.

For more facts circle 553 on Reply Card

No "man-handling" here



Tired of wrestling with heavy dies?

Take a tip from Fairchild Aircraft, which built this hydraulic die wagon and equipped it with Bassick grooved-wheel casters. They're the best solution yet to the problem of moving materials frequently over a fixed route.

Accurate Control

This ingenious wagon employs hydraulic power to place and remove press dies. It completely eliminates laborious manhandling with the help of chain falls and skids. Bassick grooved-wheel casters permit accurate control of wagon, make movement 3 times easier than flat wheels in direct contact with floor. They roll on easily installed angle iron track which is inexpensive and self-cleaning. They're made in both swivel and rigid types, with wheel diameters of 4″, 6″, 8″ and 10″.

Write for facts

We'll be glad to supply more data on the Bassick products you see here. Bassick makes the world's largest line of casters, assuring you the right type for any moving job. Check your Bassick industrial distributor or write us direct.

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

Bassick A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS... MAKING CASTERS DO MORE

75 YEARS OF CASTER LEADERSHIP

Why pay for Replacements Over and Over and Over?

GLAZE

WITH

PLEXIGLAS

It isn't the price of glazing material that makes window-replacement costly. The big item is labor and factory overhead, every time you have a broken pane replaced. When you pay for this over and over again in high-breakage areas, maintenance costs go up fast.

You can prevent frequent breakage and cut maintenance costs way down by glazing with PLEXIGLAS® acrylic plastic. This tough, light weight, *outdoor plastic* withstands the severe service conditions of industrial plants—impact, twisting, and vibration.

In addition, PLEXIGLAS:

- . . . increases safety of personnel.
- . . . eliminates need for expensive, hard-to-maintain, protective wire screens.
- . . . is available in transparent and translucent colors for the reduction of solar heat and direct sky glare.

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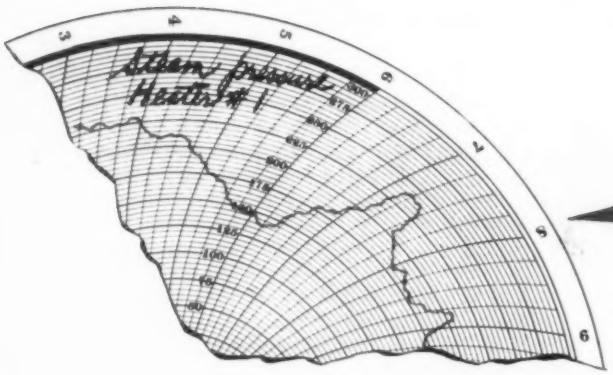
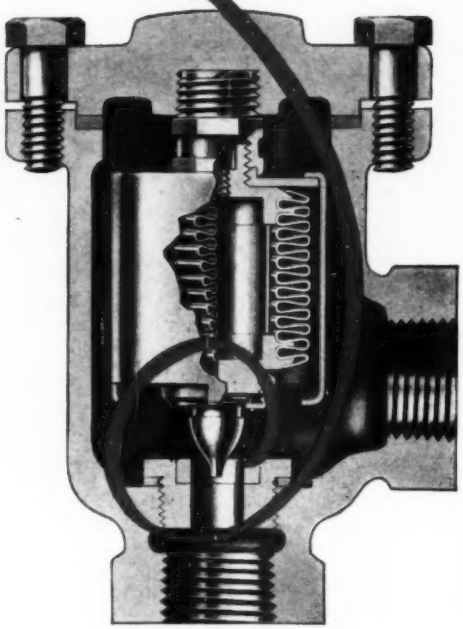


Same size seat and head for all pressures to 300 psi!



Is this your steam TRAPPING PROBLEM...

Changing seats and heads for varying loads or pressures to 300 psi?

HERE'S HOW to select the right trap!

First thing to do is to define exactly what you expect the trap to do—and then select 1 of the 5 *different* types best suited for the job on hand. If you need a trap with *one or all* of the following characteristics, then the Sarco Thermostatic Trap is your best bet.

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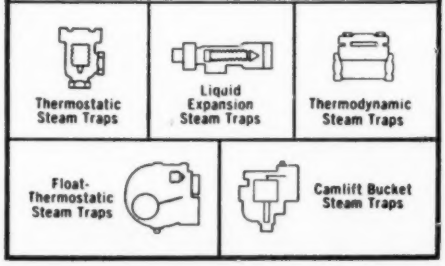

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Unbelievable! Miraculous! May sound so. Yet that has been accomplished many, many times. And the reason is simple. Tramrail eliminates need of wide aisleways, permits high piling, provides fast overhead deliveries. In addition, there are other advantages.

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THE CLEVELAND CRANE & ENGINEERING CO.
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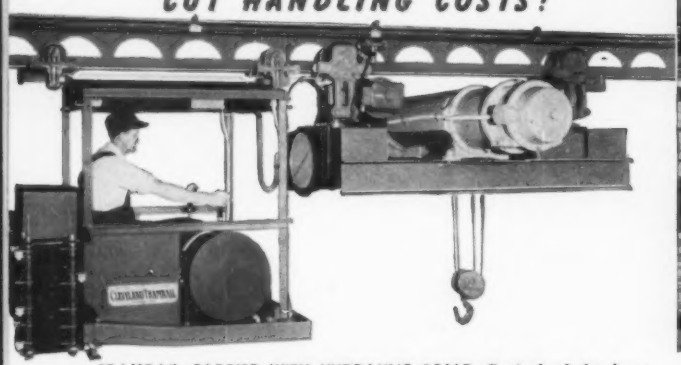
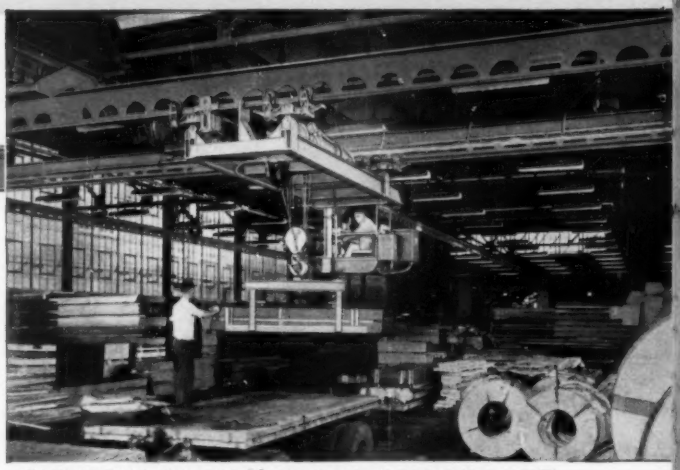
Here's Proof
THAT OVERHEAD HANDLING METHODS *CUT HANDLING COSTS!*



TRAMRAIL CARRIER WITH HYDRAULIC SCALE—Typical of the large variety of Cleveland Tramrail units designed for a multitude of applications and conditions is this cab-operated traveling carrier equipped with a hydraulic scale that weighs all loads handled, quickly and easily.



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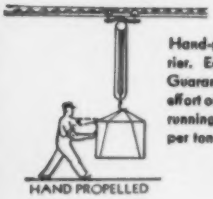

Hand-propelled carrier. Easy operating. Guaranteed starting effort only 15 lbs. and running effort 10 lbs. per ton weight.

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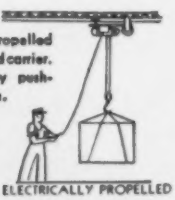
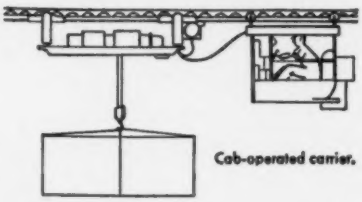


ELECTRICALLY PROPELLED

CLEVELAND TRAMRAIL carriers embody engineering principles which insure proper performance of each unit and successful operation of an entire Tramrail system. Long-wheelbase carriers prevent hopping or jumping. Swivel wheel yokes provide flexibility and prevent wheel flanges digging into sides of track. Wide flat treads make large area of contact with flat Tramrail runway rail, resulting in smooth, easy operation and long life.



Cab-operated carrier.

Carriers for nearly every handling need are available: Hand-propelled; motor-driven; floor-controlled; platform controlled; cab-operated.

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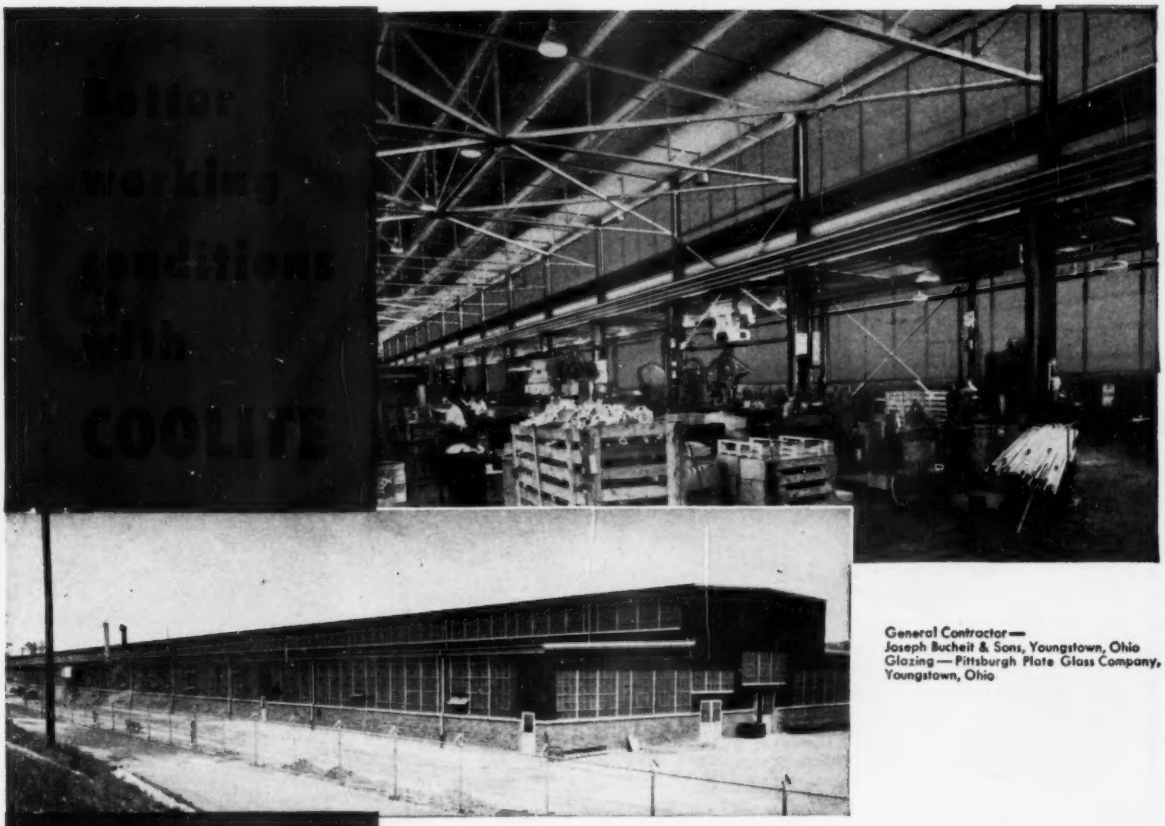
Cleveland Tramrail's great nation-wide sales organization is composed of experienced engineers who know industry and its handling problems —and how to solve them. Their chief concern is to provide the most satisfactory method, whether it be by overhead Tramrail or some other means. They are careful to avoid misapplication. You can depend on the advice of your Cleveland Tramrail distributor.

CLEVELAND TRAMRAIL DIVISION The CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio



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REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

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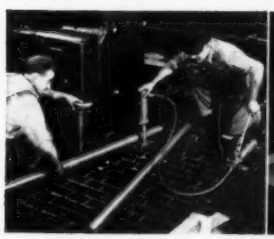
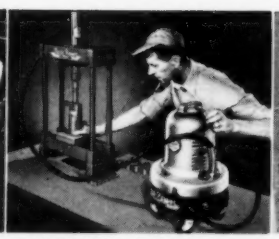
Here's how Porto-Power hydraulic tools cut costs in every department

"Porto-Power" is MUCH MORE than a remotely controlled hydraulic jack! It's a whole "family" of tools — pumps, rams, valves, presses, spreaders, extensions and clamps. From it, you can select just the *right* items for the particular job at hand.

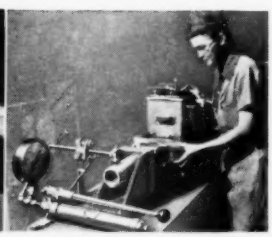
Ram sizes: 2, 4, 7, 10, 20 and 50-ton capacities



MAINTENANCE JOBS — 9 man hours saved lifting and settling this machine! That's because "Porto-Power" *toe-lift* setups eliminated time-wasting crowbar methods. Other setups — push, pull, clamp, press, spread, bend — produce similar big savings.



PRODUCTION PROBLEMS are spectacularly solved. Standard, low-cost hydraulic "Porto-Power" items assemble into shop-built workholders for pressing, straightening, punching, welding and other fabricating. And — "Porto-Power" items are readily available from distributor stocks.



JIG AND FIXTURE APPLICATIONS — More and more tool engineers and methods men find "Porto-Power" the happy answer to make quick, rigid setups. Exceptional versatility makes "Porto-Power" perfect for short-run or custom work as well as long production runs.

Only "Porto-Power" does all these things!

Only Blackhawk has a complete line of remotely-controlled hydraulic jack equipment . . . including rams, pumps and vital work-attachments. That's why *every* department finds use for "Porto-Power" — in the hundreds of spots where hydraulic force is faster, easier, safer. You *save* on the equipment budget — and you make absolutely spectacular savings in maintenance, production, laboratory, tool room, field service, wiring and construction. Ask for full facts from leading industrial supply distributors or see us at the PLANT MAINTENANCE SHOW, CHICAGO, Jan. 25-28. Booths 1312-14.

BLACKHAWK®

"Porto-Power" is made only by the makers of Blackhawk Hydraulic Jacks and Blackhawk Hand Tools

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It's easy to pick the *right* "Porto-Power" for your job

Everything's standard and cataloged in this big line of hydraulic rams, pumps and work attachments. Low-cost, too! Example: **S-71** pump, hose and 10-ton ram — only **$62.00.**

You can buy "Porto-Power" items singly or in complete ass'ts. A popular cost-cutting kit for maintenance crews is this **S-31** ass't — complete with 10-ton hydraulic unit and 2½ work-saving attachments. Only **$125.50.**

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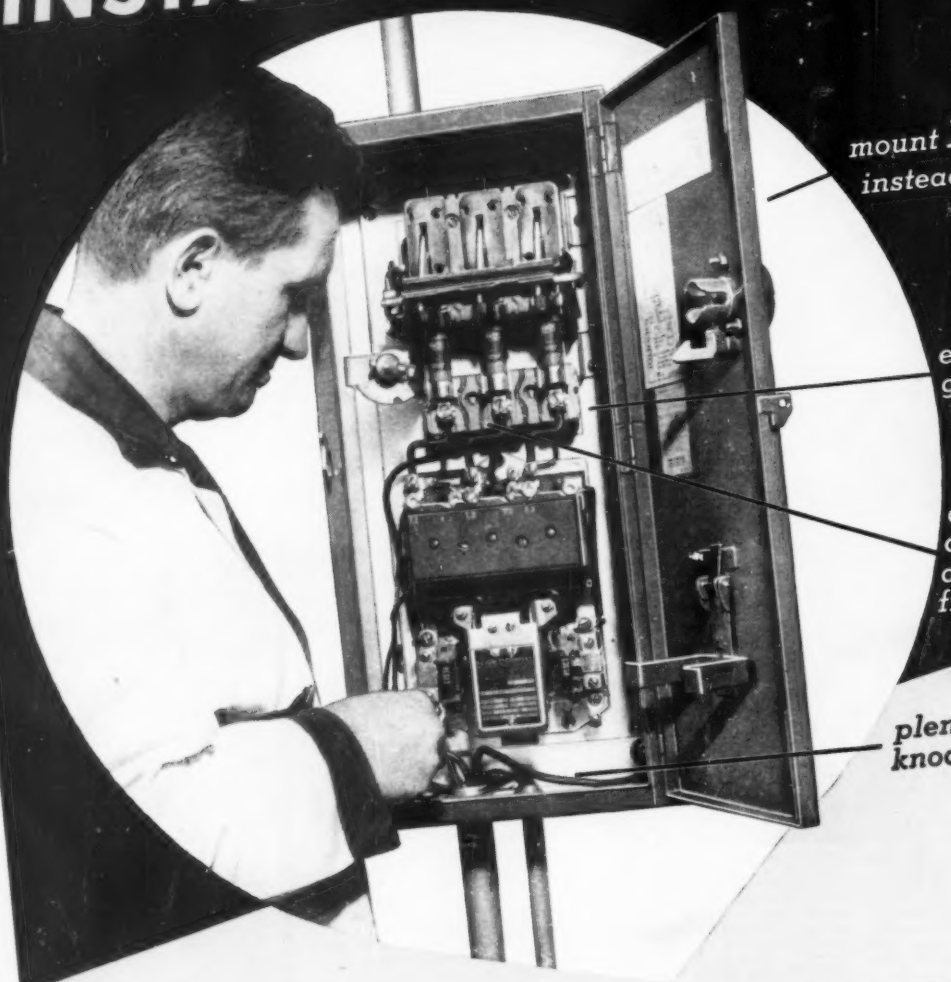

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CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by Byron A. Engelbach, Plant Engineer

SHEAR

STRUCTURAL MEMBERS which are in the category of beams are subjected to two types of *Shear*: Vertical and Longitudinal. In addition to the bending stresses in a beam, there is a tendency for one portion of a beam to slip by the adjacent portion, and this tendency is referred to as *Shear*, and the resistances offered by the fibers of the beam is called the *Shearing Stress*.

Vertical Shear

Refer to Fig. 1 showing a simple beam acted upon by the force or load W. The tendency for the load to push down a portion of the member, as shown, is referred to as *Transverse* or *Vertical Shear*. It should be noted that the intensity of the shear to the left of the load carries a plus sign and any shear to the right of the load is a minus quantity. Or, when at any section A the portion of the beam to the left of the section tends to move upward the shear is *plus* or *positive shear*, and when at any section B, the portion to the right of the section tends to move upward, the shear is *minus* or *negative shear*.

Longitudinal Shear

Figure 2 shows how two sections of a beam tend to slip by each other in *longitudinal* or *horizontal shear*, which acts at right angles to vertical shear. When the beam bends, the longitudinal fibers in one portion of the beam tend to be compressed and in the portion on the other side of the neutral axis the fibers tend to stretch. Somewhere in a beam is a neutral plane or axis where the fibers are neither stretched or compressed; at this point the greatest intensity of longitudinal stress or shear occurs. Longitudinal shear will be discussed in later Briefs. For the present it is sufficient to know that theory shows and experiments have verified satisfactorily that when the length of a beam is less than ten times the depth, failure will occur by longitudinal shear; when it is more than ten times the depth, failure will occur due to bending.

Computation of Vertical Shear

To compute the vertical shear at any specific section, simply find the algebraic sum of the vertical forces to the left of the section. Or, vertical shear is equal to the left reaction minus the sum of the vertical downward forces acting between the left support and the section in question.

It has been stated previously that the point of zero shear and the point of maximum bending coincide. Under certain conditions, especially in the case of combined uniform and concentrated loading, there is no point where the shear actually equals zero, but instead it will change from positive to negative. This point is also considered as the point of zero shear and maximum bending.

Refer to Fig. 3. The reactions have been previously calculated for this example in Construction Briefs, PLANT ENGINEERING, November 1953 issue, page 71, and found to be 16,500 lb at R-1 and 13,500 lb at R-2. To find the shear at a point 12 ft from the left reaction, or at the point of zero shear, the procedure is:—

From reaction R-1, deduct the sum of the loads between that point and the point where shear intensity is desired or,

$$\text{Shear} = 16{,}500 - (16{,}000 + 4000) = -3500 \text{ lb}$$

The sum of the loads deducted is greater than the reaction and therefore the shear of 3500 pounds is negative. Also, since the sign of the shear changes from positive to negative, it follows that the point of maximum bending is under the 4000 pound load where the shear is considered as zero shear.

Shear Diagram

A *Shear Diagram* or *Shear Curve* is a graphic representation of the vertical shear at all cross sections of a beam, a line drawn to show the magnitude and direction of the shear at each section of a beam acted upon by definite transverse loads. A set of problems with accompanying illustrations and solutions will best demonstrate this subject.

Illustrative Problems

Problem 1: Find the shear for a simple beam 12 feet long carrying a concentrated load of 2000 pounds. Data: Fig. 4. Neglect the weight of the beam.

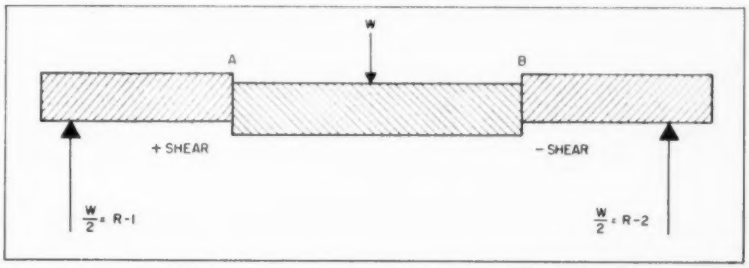


Fig. 1. Offset section of simple beam represents shearing action of imposed load

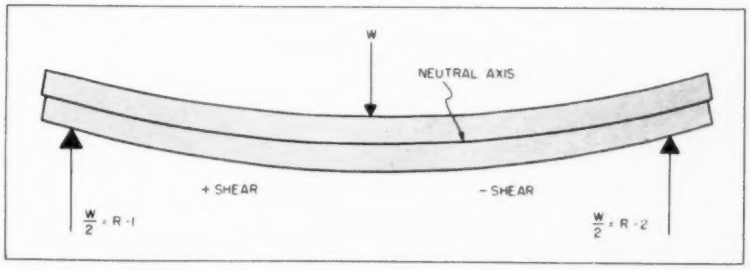


Fig. 2. Sketch shows longitudinal shear of beam sections about neutral axis

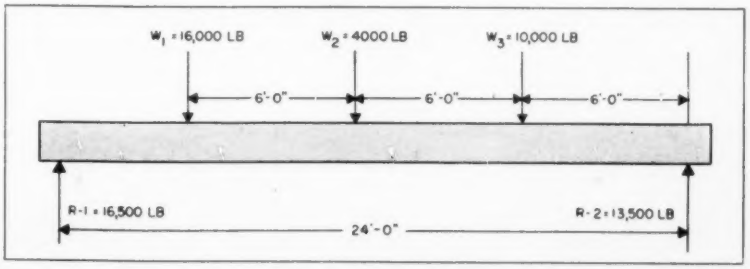


Fig. 3. Loaded beam arrangement for finding shear at a given point on beam

Solution: By observation, each reaction is 1000 lb.

Calculate the shear at one-ft intervals along the length of beam. Then shear at V_0 or R-1 is 1000 lb, $V_1 = 1000$ lb, etc. to V_6 where the first downward force is to be deducted and $V_6 = 1000 - 2000 = -1000$ lb. There are no other downward forces to deduct and therefore the shear will remain as —1000 lb to the reaction R-2.

To construct the shear diagram:

Draw a horizontal line X-Y to a scale of 12 units, representing the 12 foot beam. At one-unit intervals erect perpendicular lines as indicated by X-A, 1-B, 2-C, etc.

Using an appropriate scale representing pounds, set off on X-A the amount of 1000. Since this is a positive quantity, it will be plotted above the line X-Y. Proceed to set off the shear quantities found until the line GHI is reached. At this point the shear is —1000 lb which should be set off on the vertical line below the X-Y axis because it is negative. Above point I as a plotting starting point set off the 2000-lb concentrated load which will establish the positive point of shear. Plot the remaining negative shear quantities. Connect the points A, B, C etc, through to O by straight lines, thus completing the shear curve and the shear diagram.

Scaling Vertical Shear

The vertical shear at any point along the beam can now be scaled on a vertical line from the X-Y axis to the shear curve and then converted into pounds with no further calculations. The point of zero shear is visually indicated as is the point of maximum bending.

Problem 2: Construct the shear diagram for a beam 12 ft long, carrying a uniformly distributed load of 100 lb per linear foot including its own weight.

Data: Refer to Fig. 5.

Solution: Each reaction is one-half the total load of 1200 lb, or 600 lb. It is obvious that the shear values at one-ft intervals across the beam diminish by increments of 100 lb from R-1 with a positive shear of 600 lb to R-2 with a negative shear of —600 lb.

To construct the shear diagram, draw the axis X-Y to represent the 12-ft beam and erect perpendiculars at one-ft intervals. Next, plot the shear intensities on these vertical lines to a suitable scale, remembering that the positive shear is plotted above the axis and the negative shear plotted below the axis. Connect the points plotted by straight lines and the shear diagram is complete.

Problem 3: Construct a shear diagram for a beam 18 ft long which rests on two supports one 4 ft from the left end and the other at the extreme right end. The beam is loaded uniformly at 150 lb per linear foot including the weight of the beam.

Data: Refer to Fig. 6.

Solution: The reactions R-1 and R-2 are found to be 1875 lb and 1125 lb respectively.

Draw the axis X-Y to scale and erect perpendiculars at the reaction points.

Since the beam overhangs the support at the left end, the shear will be at zero at this point. The reaction point is 4 ft from end of the beam and shear reduces $150 \times 4 = -600$ lb. Therefore point A is plotted as —600 lb below the axis.

Point C, being the total reaction or $-600 + 1875 = 1275$, is plotted 1875 lb above point A and 1275 above the axis, since it is a positive quantity.

Reaction R-2 is next plotted as a negative quantity below the axis.

The shear diagram is completed by connecting the points plotted by straight lines.

To locate the distance from the Reaction R-2 to the point of zero shear, divide the reaction by the uniform load of 150 lb per linear foot to find 7.5 ft.

Another method of finding this point is by proportion, since two similar triangles are involved.

Let X = Distance from R-1 to zero shear.

16—X = Distance from R-2 to zero shear.

$$\text{Then } \frac{X}{16-X} = \frac{1275}{1125}$$

$$X = 8.5 \text{ ft}$$

$$16-X = 7.5 \text{ ft}$$

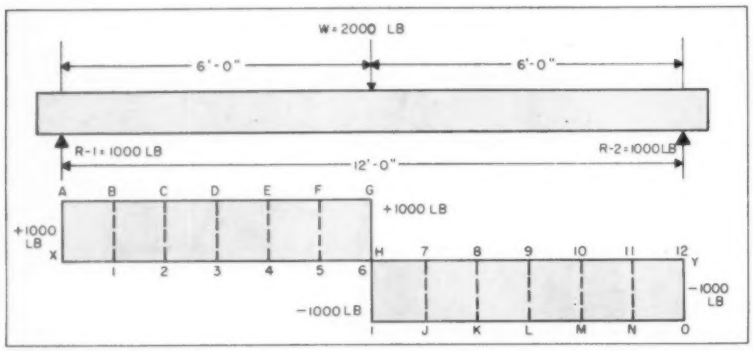


Fig. 4. Shear diagram drawn to show resulting forces in center-loaded beam

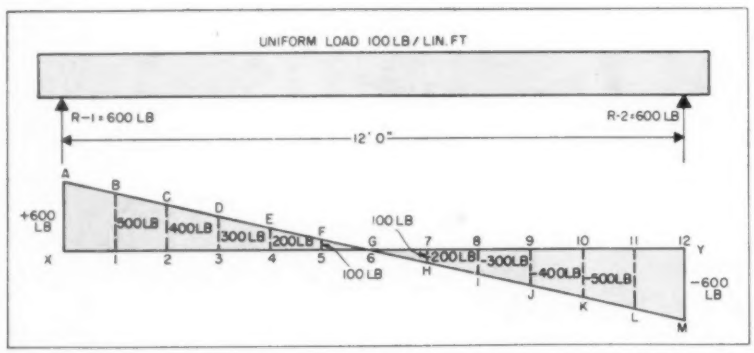


Fig. 5. Method of shear diagram construction for a uniformly-loaded beam

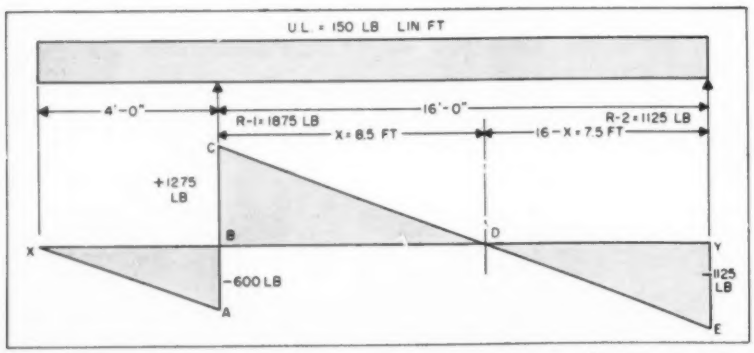


Fig. 6. Shear diagram construction for a uniform beam, unevenly supported

Suppose we put the Dempster-Dumpster System right down in your plant . . . then what?

● *Well First—let's make it clear that we are furnishing you with several sizes of different designs of 26 containers to suit your materials requirements. Then bear in mind that we are delivering you only one truck-mounted Dempster-Dumpster and with your driver this one outfit picks-up, hauls and dumps all containers, about like the one shown above.*

Now, how many conventional trucks are you using for handling rubbish, scrap, raw materials, and what have you?

For several years now, one plant has been doing considerably more work with two Dempster-Dumpsters and two men than they did with five trucks and fifteen men before the Dempster-Dumpster System was installed. You can guess at the approximate savings annually.

A glance at the picture below and you get the whole story of the Dempster-Dumpster System. Never before have you been able to cut bulk materials handling costs so drastically.

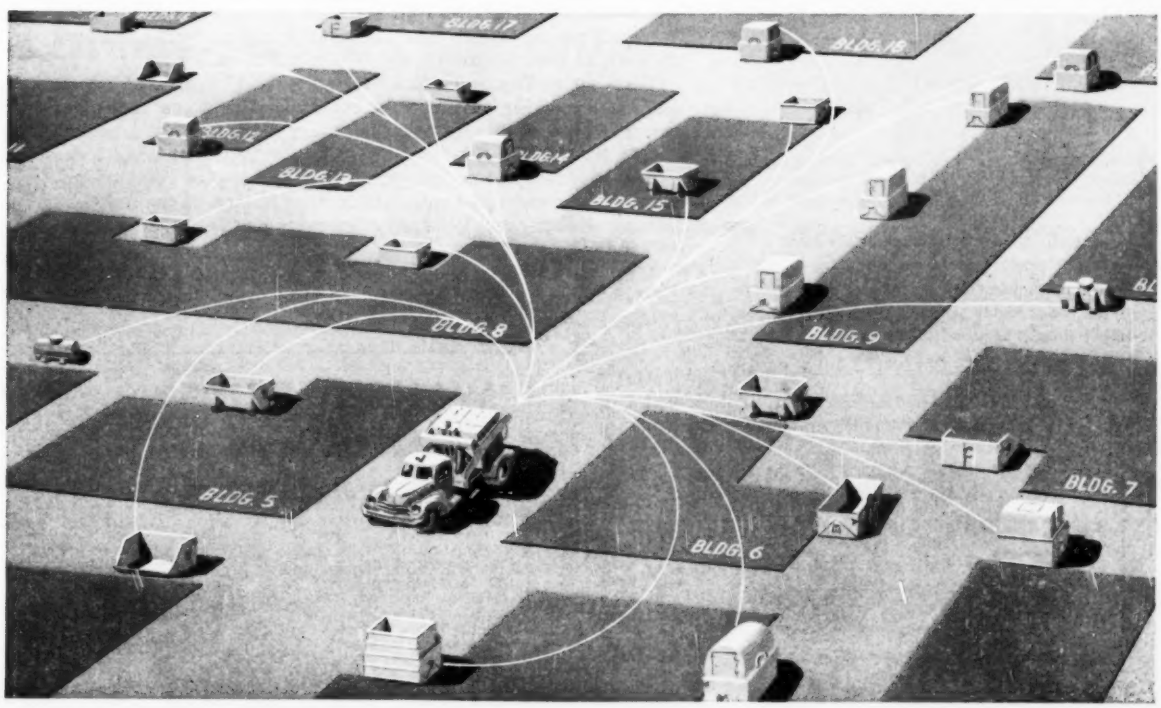
One truck mounted Dempster-Dumpster handles the entire group of 26 Dempster-Dumpster containers. These big, detachable steel containers are like having 26 truck bodies for a single truck.

Any required number of Dempster-Dumpster containers are spotted at convenient materials accumulation points inside and outside your buildings. They range in sizes up to 12 cu. yds.—3 to 4 times the capacity of a regular dump truck. Materials—bulky, light, heavy, solids, rubbish and even liquids—are dumped or placed into these containers.

The truck mounted Dempster-Dumpster makes scheduled rounds, picks up each preloaded container, carries it to the point of disposal, sets it down intact or dumps the materials and returns the container for refilling. The entire operation is hydraulically controlled and handled by your truck driver.

It's as simple as we have described it. The amazing thing is the tremendous savings being made by the Dempster-Dumpster System in hundreds of leading industrial plants over the nation.

A product of Dempster Brothers, Inc.



DEMPSTER BROTHERS, 114 Shea Building, Knoxville 17, Tennessee

For more facts circle 561 on Reply Card

eliminate towel waste with WESTROLL!

The Westroll towel dispenser has relatively few working parts, so its maintenance factor is negligible. Westroll dispensers are streamlined, easy to keep clean. They assure a constant supply of towels, help keep washrooms spic and span, save costly janitors' time.

It's human nature to take advantage of an overly generous paper towel dispenser. Particularly so with interfold or flat towels where two, three or even four are used for one drying. But with Westroll, people tend to take just enough and no more. You save as much as 40% on towel costs.

Tests show Westroll users average only 17 inches of paper, against 22, 33, or 44 inches of interfold. Users can crank out exactly the amount of towel necessary – even as little as two inches for lipstick removal! These are immediate savings.

You also save on maintenance. One filling of a Westroll micromatic dispenser is equivalent to *four* fillings of the ordinary flat-towel dispenser. Westroll dispensers are loaned and maintained by West.

Westroll towels are outselling our interfold towels 20 to 1. No customer has ever switched back to interfold towels after trying Westroll!

WEST DISINFECTING Company

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Dept. 52

I'm interested in:

☐ A FREE leaflet on WESTROLL.

☐ A talk with a West expert about my washroom problems. No sales pitch. No obligation. Just discussion and a demonstration if I want it.

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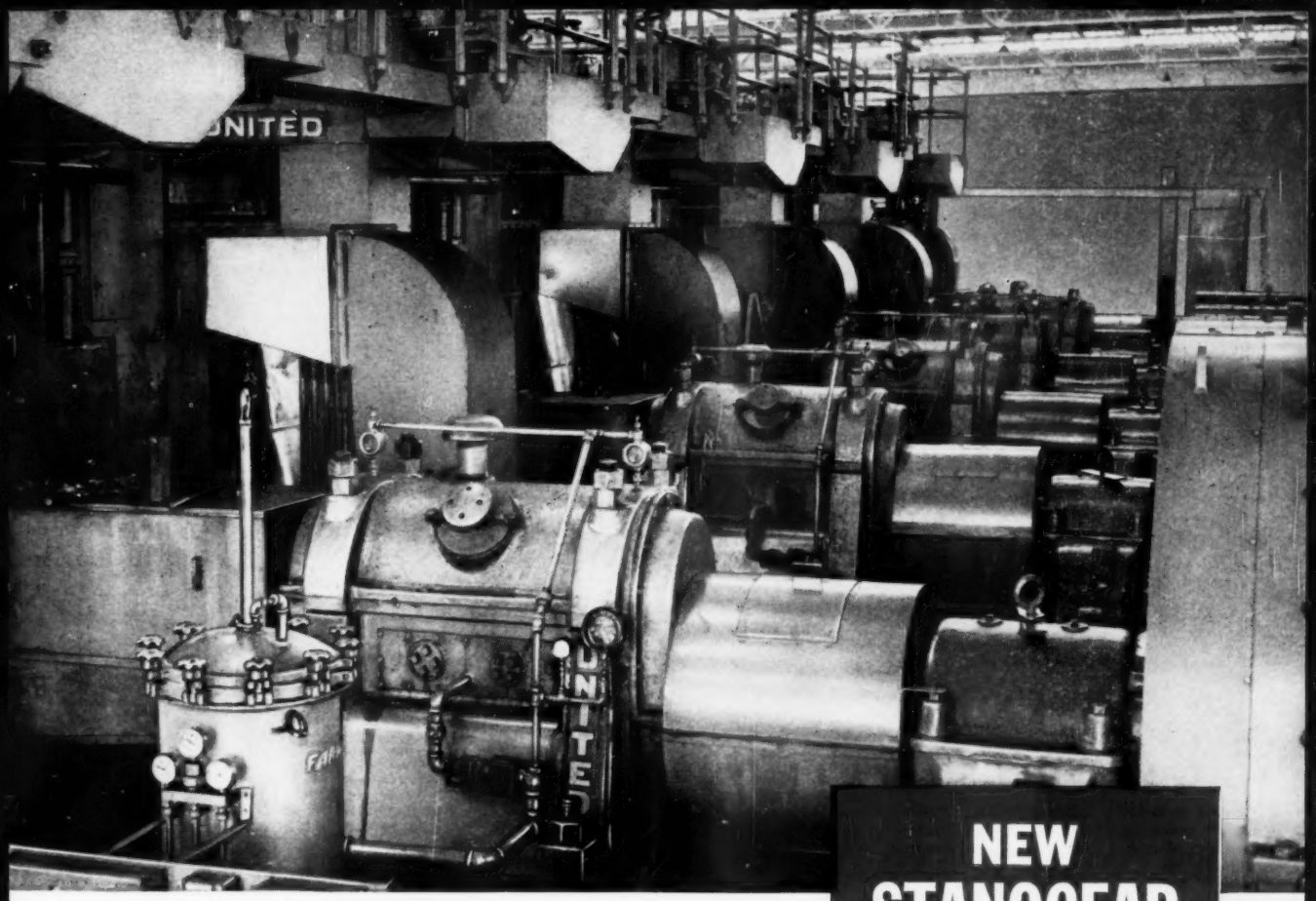

NEW STANOGEAR
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Compounds

NOW . . . 7 ways better for extreme-pressure lubrication . . .

New and improved STANOGEAR Compounds have been developed to meet the requirements of an increasing variety of tougher extreme-pressure lubricating jobs found throughout industry, today. The result of several years of special research and field test work, these outstanding products have proved in actual service their ability to provide these important advantages:

1. Higher load carrying capacity. Use of improved extreme-pressure additives in STANOGEAR Compounds provide a greater anti-weld property. This results in the higher load carrying capacity which these products have demonstrated in actual service.

2. Superior retention of load carrying capacity. In service tests, STANOGEAR Compounds have proved superior to conventional extreme-pressure lubricants in ability to maintain a high load carrying capacity over extended periods of service.

3. Freedom from objectionable deposits. Appropriate base stocks and additives give STANOGEAR Compounds a high resistance to oxidation, thus minimize the formation of deposits.

4. Excellent storage stability. STANOGEAR Compounds contain compounding ingredients which assure excellent stability both in service and storage.

5. Good water separation. STANOGEAR Compounds have demonstrated their superiority to ordinary extreme-pressure lubricants in ability to provide good water separation.

6. Anti-foaming. Under adverse operating conditions, the anti-foam agent in STANOGEAR Compounds has prevented foaming troubles.

7. Versatility. A unique combination of additives in STANOGEAR Compounds equips these products for various industrial gear applications where extreme-pressure lubricating properties are necessary. To meet varying viscosity requirements, STANOGEAR Compounds are available in eight viscosity grades.

The Standard lubrication specialist in your area of the Midwest will be glad to give you more information about the new STANOGEAR Compounds. You need only phone your local Standard Oil office. Or write: Standard Oil Co., 910 South Michigan Avenue, Chicago 80, Illinois

STANDARD OIL COMPANY STANDARD *(Indiana)*

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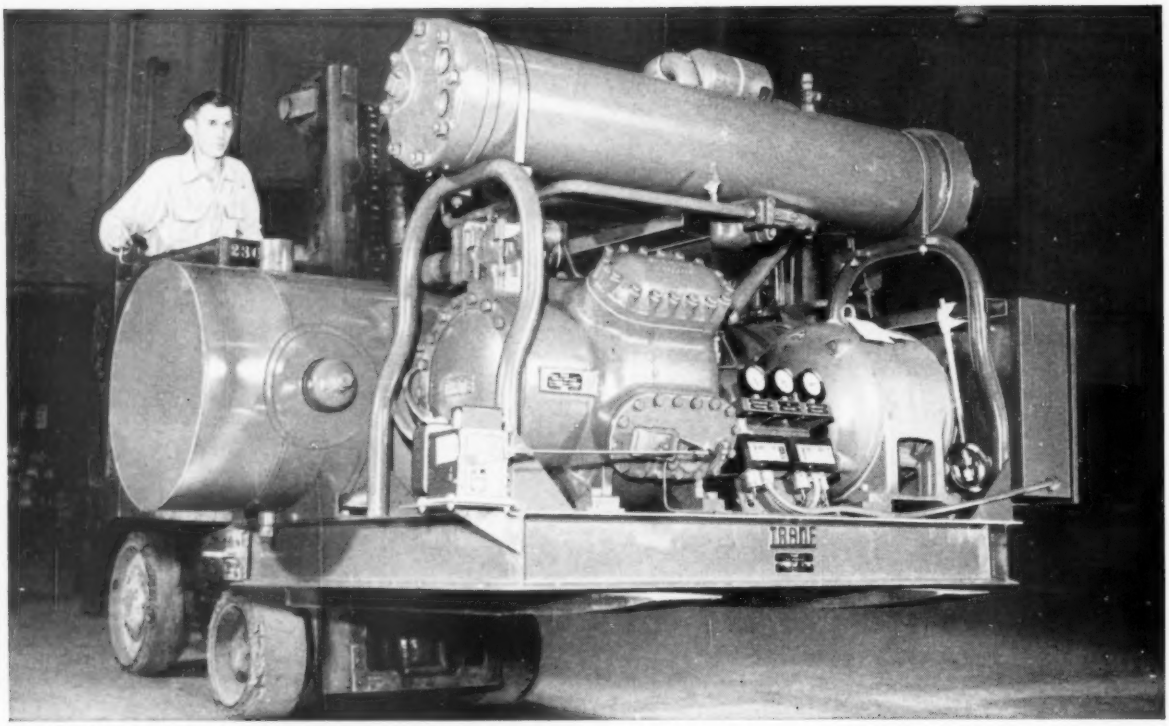


Ready to install . . . the new TRANE Cold Generator is a complete mechanical refrigeration machine for producing chilled water. Wired, piped, refrigerant-charged. All interconnected for immediate process cooling or comfort air conditioning applications. Ten sizes, 10 to 100 tons. 25 h. p. unit illustrated. For jobs larger than 100 tons, see CenTraVac below.

New Trane packaged water chiller comes ready to run!

It's wired, piped, refrigerant-charged at the Trane factory!

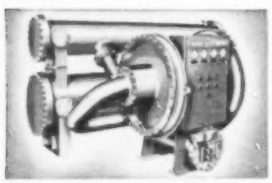
A quick, low-cost source of process cooling. Now you can have chilled water from a single packaged unit at the temperature exactly right for air conditioning . . . or for electroplating, metal quenching, die cooling, rubber mixing, brewing . . . almost any industrial process.

Ready to run. Here's what you get in this one compact, ready-to-run assembly: Compressor and motor, condenser, insulated dry expansion chiller, insulated heat exchanger, refrigerant piping, safety valves, wiring and automatic controls for full or partial load operation. Everything is there . . . carefully engineered, exactly matched, completely assembled. Ready to run as soon as simple plumbing and electrical hook-ups are made.

Rugged, easy to relocate. The TRANE Cold Generator is no fragile piece of equipment. It's designed for rugged factory use. Machine vibrations won't affect its smooth operation. And since it is so compact and requires no special base, it can be quickly moved to new locations when necessary. The average-size unit can be lifted with a fork-lift truck.

Now—accurate control! The Cold Generator makes precise temperature control a factor you can depend upon. No guesswork. You know that the temperature for your particular operation will be delivered exactly as required.

Get all the facts. Contact your nearest TRANE Sales Office or write TRANE, La Crosse, Wisconsin, for Cold Generator application and performance data.



For larger jobs, select the TRANE CenTraVac. This hermetic centrifugal refrigeration unit provides 45 to 400 tons of refrigeration. Self-contained, completely automatic.

TRANE Climate Changers heat, cool, humidify, dehumidify, filter and circulate air . . . singly or in combination for comfort or process applications. Capacity from 450 to 22,000 cfm.

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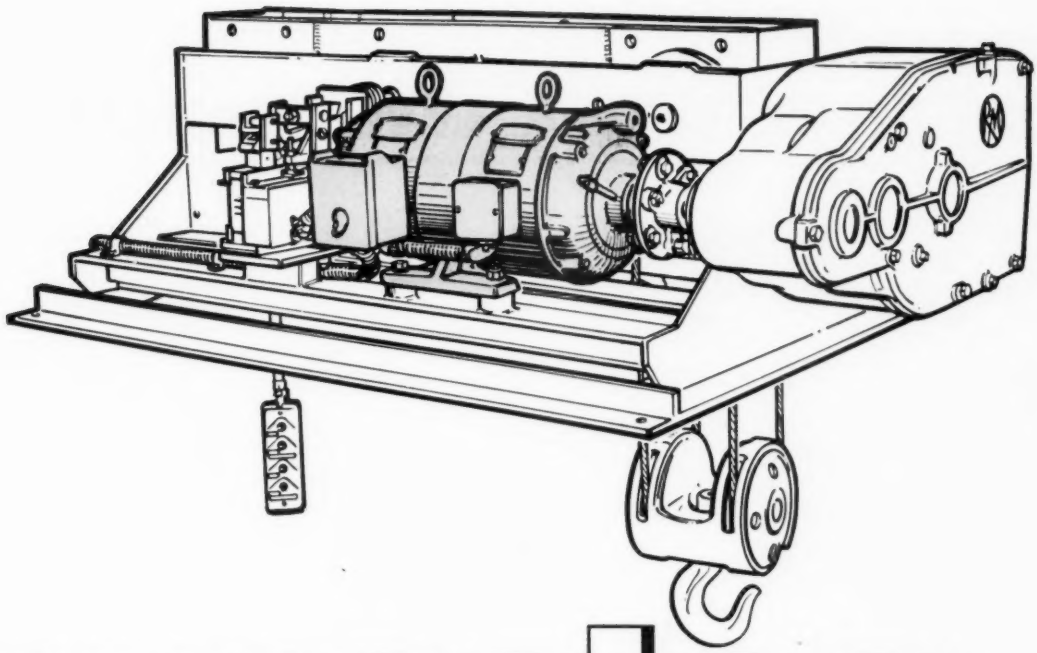
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 87 U. S. and 14 Canadian Offices.



muscles

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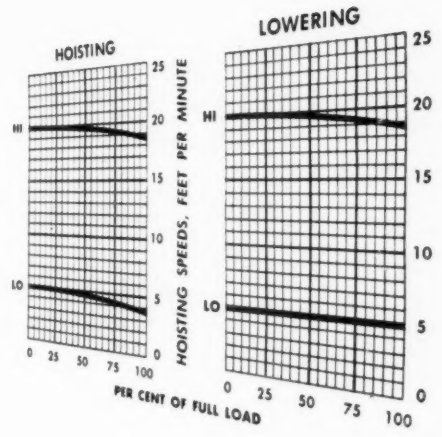
You get positive load handling from zero to rated capacity in either speed with Robbins & Myers "Dual-Duty" (two speed) hoists. Twin muscles—one fast, one slow – are embodied in the simple, trouble-free polyphase squirrel cage R&M hoist motors—linked together in a common housing. Three to one, or four to one speed ratios provide fast lift or lower, with slow gentle speed for accurate spotting. Two motors—the extra safety factor that prevents line shutdowns. If one motor should fail, the other would finish the job. And it can too! The graphs tell the story—less than 14% speed variation when handling rated load in low speed! Conventional multi-speed hoists can't touch that record. *Load Capacity:* 1,000 to 20,000 lbs.; *Speeds, low:* 2½ to 13½ f.p.m.; *high:* 10 to 54 f.p.m.; *Controls:* 2 or 4 pushbutton (4 is standard); *Mounting:* Lug or hook—plain, geared or motorized trolleys.



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VENTILATORS MOYNO PUMPS HOISTS CRANES MOTORS FANS

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Plant Engineering

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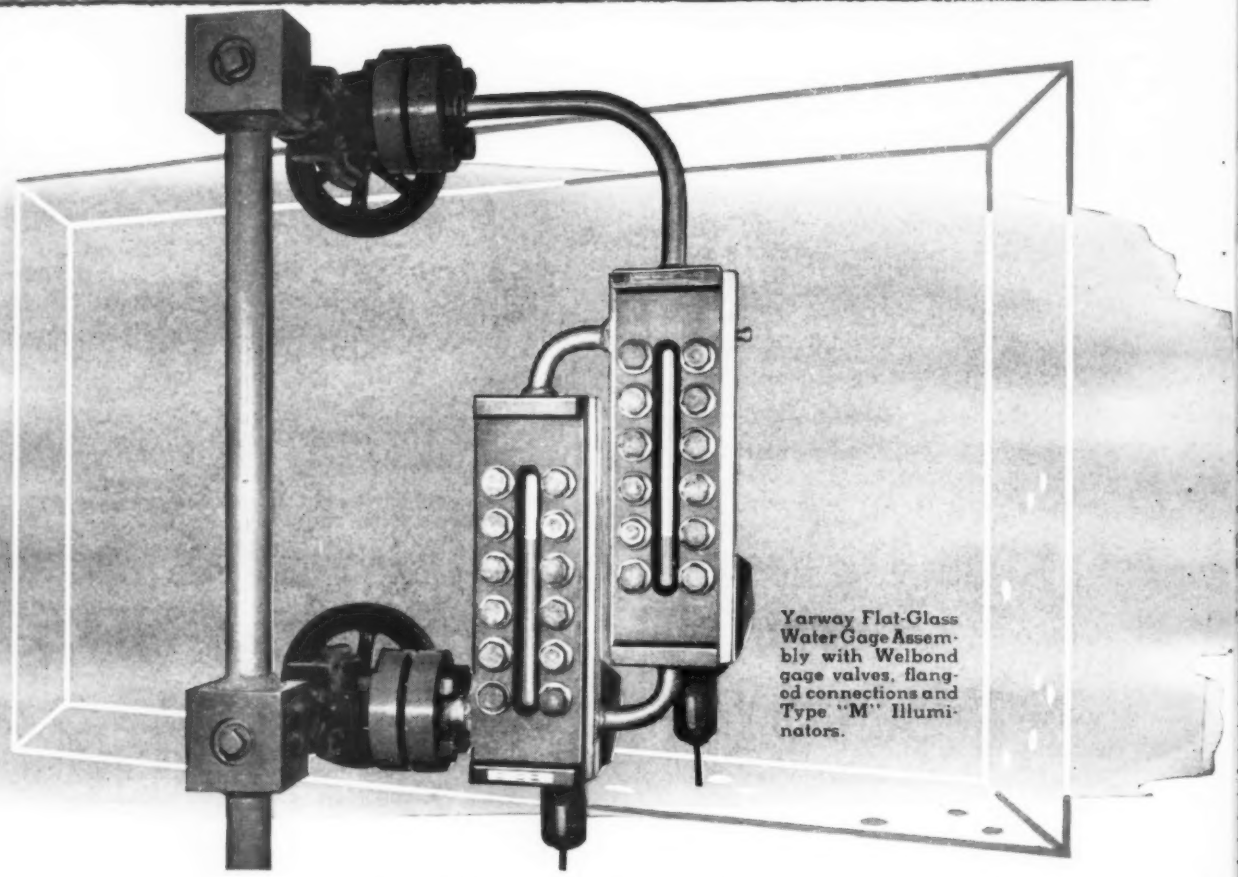
What's New

IN BOILER WATER LEVEL INDICATION?



Yarway Flat-Glass Water Gage Assembly with Welbond gage valves, flanged connections and Type "M" Illuminators.

NEW *SEPARATED-DESIGN* WATER GAGES

This new Yarway water gage assembly has been developed to meet the demands for greater dependability, longer life, and more accurate readings in high pressure service.

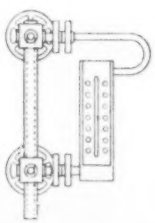
The gage glass inserts are of the Yarway pressure-sealed "floating assembly type". Yarway Welbond gage valves are used. Greater flexibility is gained by using two independent inserts, and by interconnecting expansion loops (see above).

The short connection to the drum assures greater accuracy of the gage reading, and the lower flanged connection eliminates a stuffing box. The upper flanged loop connection between the insert and gage valve allows expansion and contraction of the various components.

The tie bar-type water column linking the gage valves provides circulation to keep gage nearer drum temperature.

Yarway Type "M" Illuminators on the gage inserts cause the meniscus at water level to "shine like a star". This illuminator is especially effective in penetrating deposits on gage glass, dust particles in air and extraneous light.

For full information, write for Yarway Bulletin WG-1811.



Yarway Single Insert type gage for medium range of visibilities.

YARNALL-WARING COMPANY • 145 Mermaid Ave., Philadelphia 18, Pa.

YARWAY *STEAM PLANT EQUIPMENT*

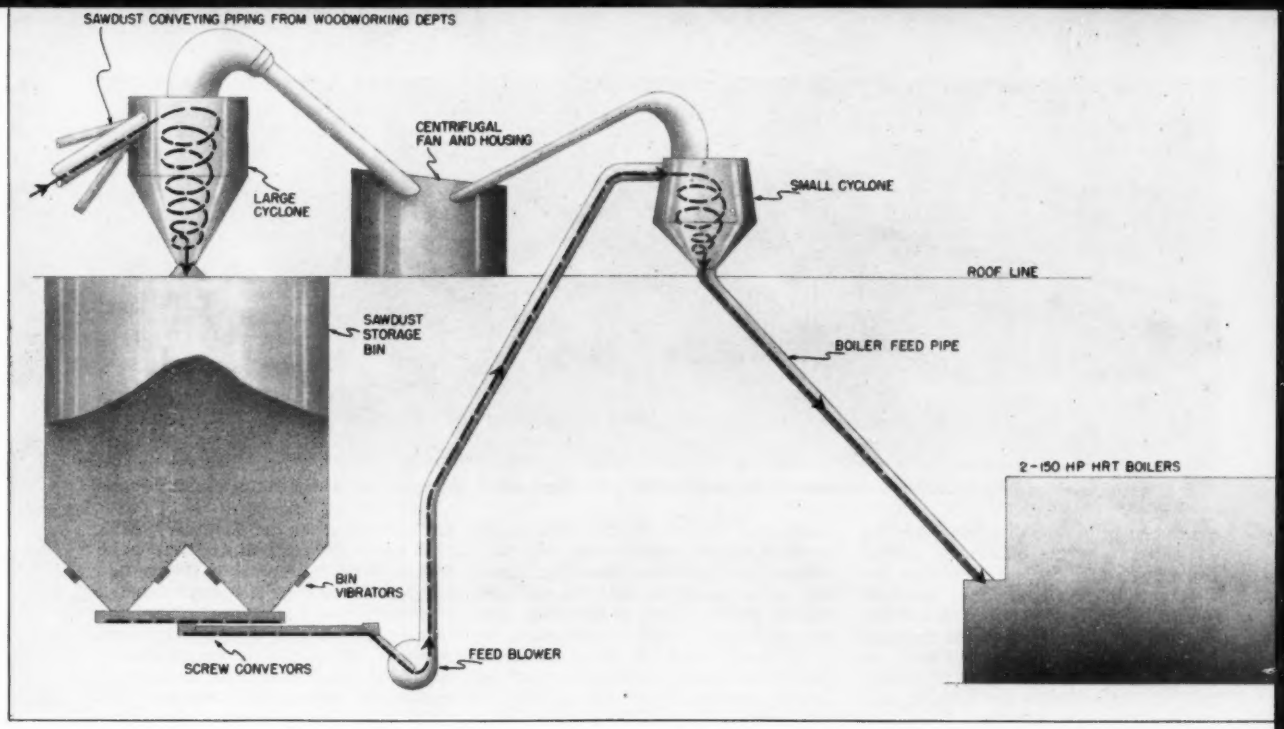


Fig. 1. Schematic diagram of wood waste collecting, disposal and burning facilities at Shwayder Brothers' Denver plant

How Samsonite Luggage Cut $6,000 from Its Fuel Bill

Large production increases made more critical than ever the problem of disposing and collecting wood refuse and sawdust . . . Fines created a fire and cleanliness hazard . . . New system eliminates both along with a $6,000 annual fuel bill . . . Steam pressure and other factors control amount of fuel fed to boilers

By **JAMES DONALD**, Production Manager, Shwayder Brothers, Inc., and **MORTON RECHNITZ, JR.**, Assistant to the Production Manager

SHWAYDER BROTHERS, INC., of Denver, Colorado, manufacturers of Samsonite Luggage, has realized many benefits and savings since the development and installation of modernized sawdust disposal and fuel burning equipment. For example, before having controlled burning, annual coal bills ran as high as $6,000.00, and since then not one ton of coal has been purchased for boiler consumption. Firing of the boilers formerly took as many as four men per shift; today the boiler room crew consists of one engineer. Maintenance and repair costs have also been drastically reduced. In addition, the plant is safer and cleaner, and the smoke nuisance and other serious handicaps have been eliminated.

In the years immediately following World War II, luggage was being produced at the rate of 3,000 pieces per day. Since 1949 this rate has steadily increased until today it has gone over the 10,000 mark. To keep pace with this large productive increase, the building area of Shwayder Brothers has grown from approximately 135,000 sq ft to over 290,000 sq ft, and the number of employees has risen from 1,000 to more than 2,500. This rapid expansion brought with it many problems, and it was soon realized that new and better methods were needed in all phases of the Samsonite operation.

One of the biggest and most critical of these problems was the collecting and disposing of ever increasing amounts of sawdust and wood refuse produced in the various woodworking departments.

For some time the sawdust from the woodworking operations had been pneumatically collected and conveyed to a separator on the roof above the boilers. This separator expelled the sawdust fines or flour, which shall be discussed later, to the atmosphere while the remainder dropped into the boiler firebox. This fine dust, discharged to the air, settled on the plant roof and surrounding area and became quite a fire hazard as well as a detriment to cleanliness. As far as the boilers were concerned, there was no control of the fuel being burned. During certain periods, there was an excessive amount of fuel which produced terrific temperatures and large quantities of smoke while, at other periods, the sawdust had to be supplemented with hand fired coal. The result was that, at times, an inexpensive fuel was being burned but the grates and boiler settings were rapidly disintegrating under these very high temperatures.

The problem in itself was simple enough—design a system which would maintain a quantity of sawdust for fuel when no sawdust was being produced and have storage space for sawdust when it was being

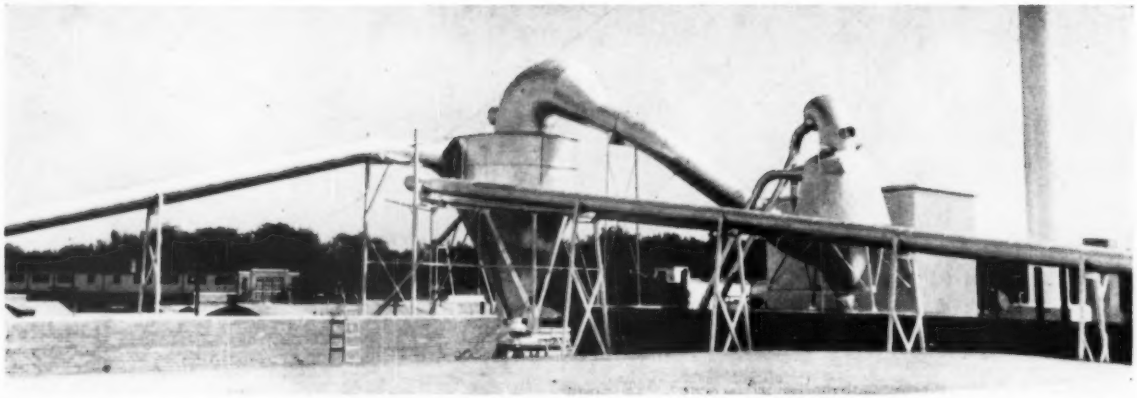


Fig. 2. After sawdust is taken from woodworking departments it is transmitted to large cyclone on left which separates fines

produced in excess of what could be expected to be the maximum hourly burning rate.

It was known that more sawdust would be acquired than could be burned on a straight steam demand basis, so the system would have to act as an incinerator also. Incineration would produce smoke, and, because Shwayder Brothers is located within the Denver city limits, this smoking was another important factor. The City of Denver has a very strict smoke abatement code. Incineration would also burn the boiler settings and the firebox grates. Therefore, the first step was to completely rebuild the boiler settings to increase the hourly burning rate. A Dutch oven was built to increase furnace volume, higher temperature refractory was used, air cooled walls were installed, grate area was increased and an over-fire airjet system was incorporated. These jets would give a blast of air over the fire and assist fuel consumption to a point where 3,000 lb of sawdust per hour could be burned before getting smoke.

The rebuilding of the settings was started in May, 1951, and completed in July, 1951.

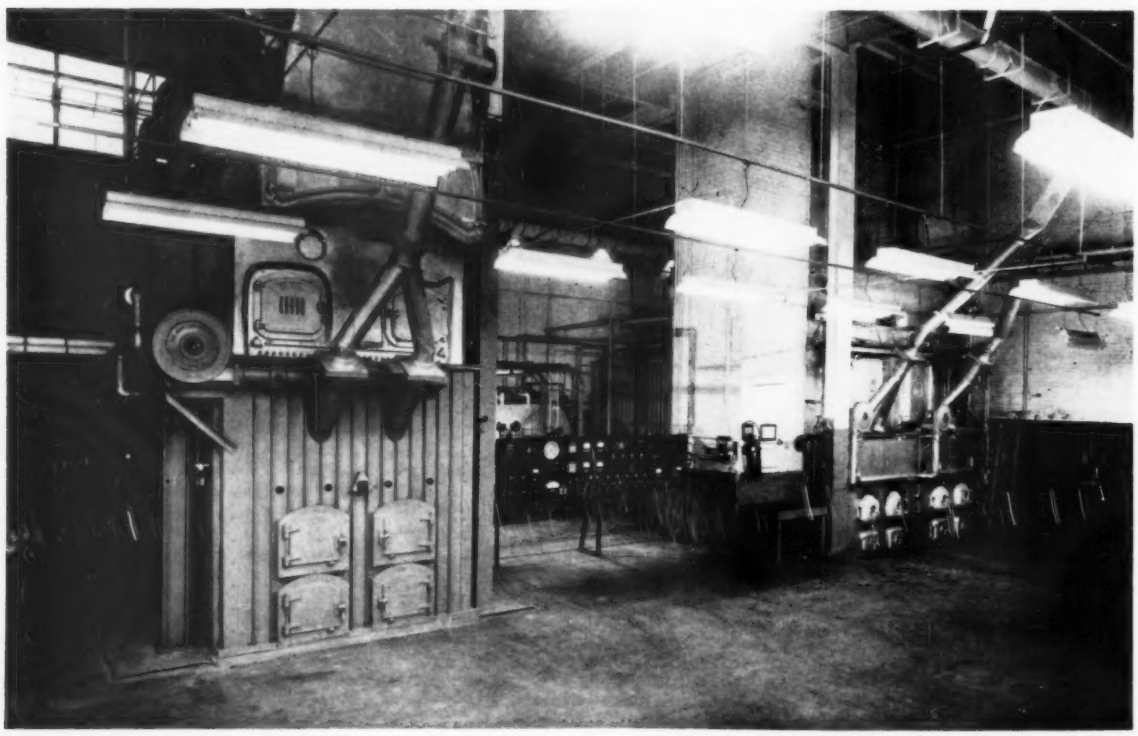
Remodeling System

Upon reconditioning of the boiler settings, the next step was the remodeling of the sawdust collecting and conveying system and the installation of the automatic controls. This work was started in July, 1951, and the complete system was ready for operation during February, 1952.

A much clearer picture of how the installation functions will be had by describing it as it operates today.

Sawdust and shavings from the numerous planers, shapers, jointers, and cut-off saws are pneumatically collected and conveyed through a system of piping to a storage bin. In addition to the sawdust and shavings a great deal of scrap lumber is accumulated in the woodworking departments. A hogger powered by a 40 hp electric motor and with a 2,000 lb per hour capacity is used to pulverize this scrap. The wood refuse produced by the hogger is also pneumatically transported to the sawdust storage bin. During the plant production periods, this sawdust and wood refuse is produced

Fig. 3. Both sawdust and a regulated amount of air passes from the small cyclone directly into fireboxes of HRT boilers



and collected at approximately 6,000 lb per hour.

Figure 1 is a schematic layout showing the general arrangement of the piping system. Before entering the storage bin the material from the mills and the hogger passes through a large centrifugal separator or cyclone. At this point it is necessary to mention that when large quantities of sawdust are collected, a certain portion of the material is in the form of tiny particles called fines or sawdust flour, mentioned previously. In the proper amounts or concentration, this flour can develop highly explosive characteristics. It is, therefore, extremely important to remove or separate these fines from the heavier wood particles. This separation is accomplished through the use of two cyclones located on the roof above the storage bin and boiler room. Figure 2 shows these two cyclones.

After the sawdust is taken from the woodworking departments, it is transmitted to the large cyclone (shown on left in Fig. 2), where, through centrifugal action, the separation takes place. The larger and heavier particles drop through the bottom of the cyclone into the storage bin while the sawdust flour is suspended in the upper portion of the cyclone. Connected to both cyclones is a large 30,000 cfm centrifugal fan. This fan pulls the flour from the cyclones, passes them through a water wash where they become saturated. The material is then flushed from the fan into a collecting tank where it can readily be removed.

After the removal of the fines in the large cyclone, the larger particles drop into the storage bin which has a capacity of 80 tons, is 20 ft high, 20 ft by 25 ft at the top, and is divided into two sections, each of which tapers to a conical shaped bottom. As sawdust does not flow readily and has a tendency to arch, each bin is equipped with two electrically operated vibrators which tend to keep the material fluid. These vibrators are mounted on opposite sides of the conical bottom and are operated alternately on a regular cycle as it has been found that this practice maintains a better flow than simultaneous operation.

Conveyor Feeding

At the bottom of each cone there is a 24 in. square outlet. These outlets are connected to a U-Trough which houses a 9 in. diameter conveyor screw 15 ft long. This screw has 6 in. pitch right-hand and left-hand flighting at opposite ends for delivering the material to a common discharge point between the two bin outlets. The sawdust drops through this discharge into a second U-Trough and screw conveyor. Figure 4 shows these conveyors. The lower conveyor carries the material to a centrifugal feed blower, which blows the sawdust back to the second or smaller cyclone located on the roof and is shown on the right in Fig. 2.

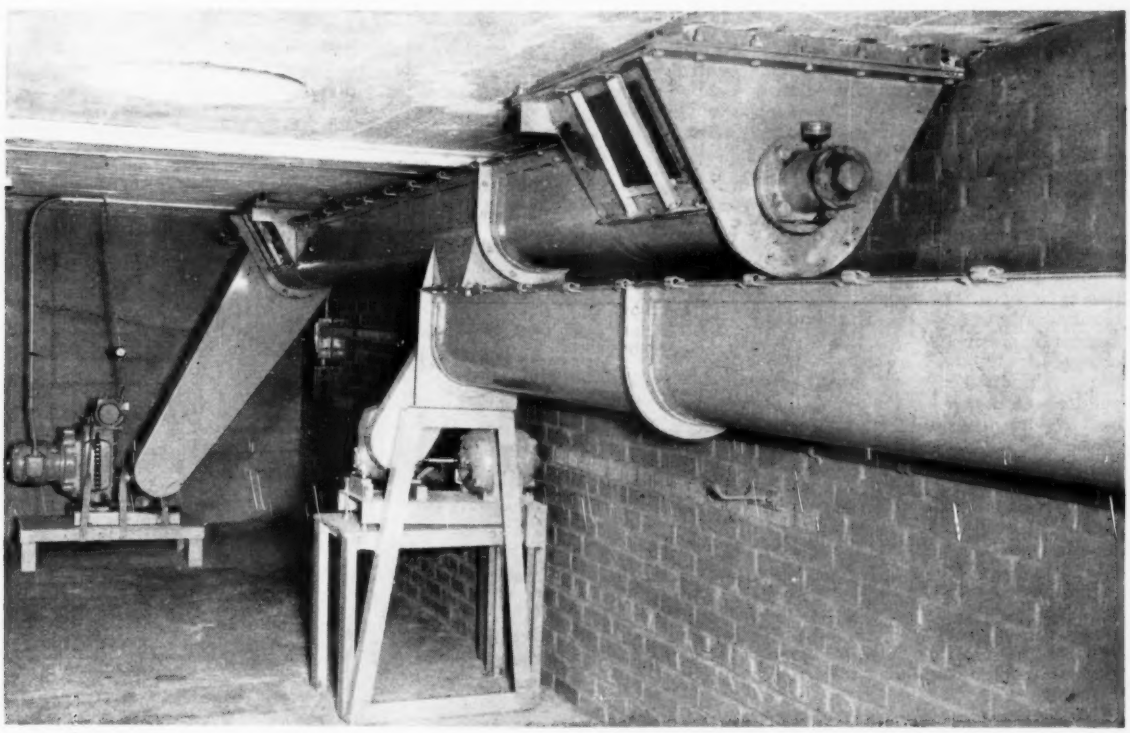
The main purpose of this small cyclone is to maintain desired firebox pressures. To convey the quantities of sawdust which are accumulated, it is necessary to use approximately 3,000 cu ft of air per minute at a velocity of 5,000 fpm. A certain portion of this air, which is developed by the feed blower, is directed into the firebox with the fuel to help combustion, but the remainder must be taken out of the system. This is done in the small cyclone. The negative pressure in the firebox is noted by a sensitive pressure regulator which positions a damper in the throat of the cyclone. The position of this damper determines the quantity of air that the large centrifugal fan will remove from the cyclone and thereby the quantity of air which will enter the firebox with the fuel. Any fines which are still present are also removed with the excess air.

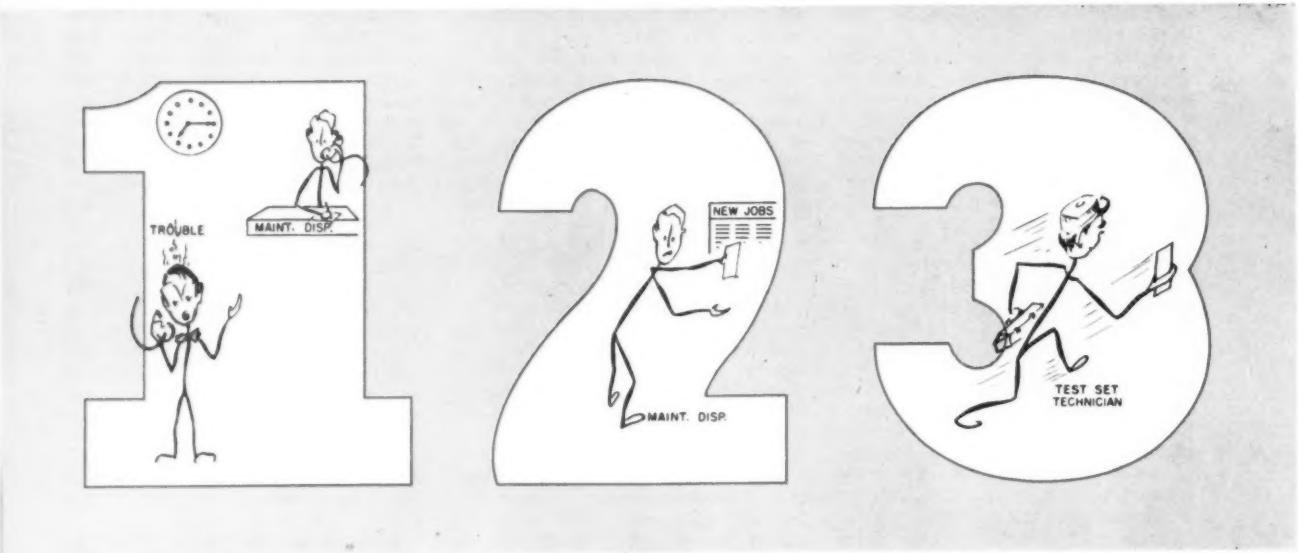
Sawdust and the regulated amount of air passes through the bottom of the small cyclone directly into the fireboxes of two 150 hp HRT boilers (Fig. 3) which are battery set to serve as a single unit. These boilers produce the steam needed to heat the entire plant and operate all steam powered equipment.

As will be seen in Fig. 4, each screw conveyor has an individual drive. The lower conveyor operates at a constant speed of 75 rpm. The upper screw conveyor is operated by a variable speed drive with integrally mounted 1 hp electric motor.

(Continued on page 171)

Fig. 4. Screw conveyors are automatically regulated by several factors so that correct amount of fuel goes to boilers





Version of what happens on a specific call: Production calls dispatcher; dispatcher makes out ticket, places it on call board;

COST CONTROL— Bonus from Centralized Maintenance

Basis of system is job ticket and dispatching center . . . Takes into account allergy of maintenance workers to record keeping, and fact that clerical costs must be kept at bedrock . . . System spots improper maintenance, abuse of equipment, design weaknesses; allocates costs and reduces them; spots "hospital cases"

By **F. O. GREEN**, Assistant Superintendent, Allentown Plant, Western Electric Co., Inc.

OUR CENTRALIZED MAINTENANCE organization, used for a number of years at the Allentown plant of the Western Electric Company, has proven far superior to the so-called area maintenance set-up. Analysis of the maintenance needed in this electronics-manufacturing plant indicated decided advantages for centralized maintenance.

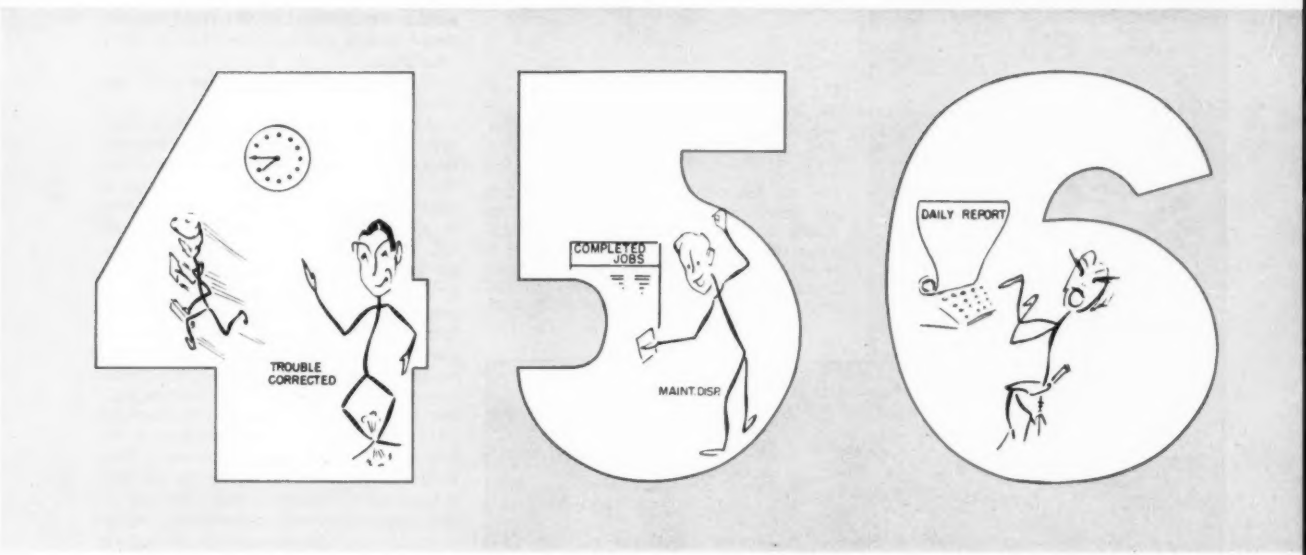
Basic plans for an organization of this type were formulated when the plant was built in 1946. The fundamental concept has remained unchanged, although a number of improvements in administrative procedures have been integrated into the system to reduce clerical expense and to give a broader picture of where and how maintenance money is spent.

Merits of centralized maintenance or other systems of setting up maintenance work, lie in the value and effectiveness of the maintenance results obtained. They must take into account the associated clerical and other forms of effort expended to provide the kind of detailed information needed to insure adequate control.

Maintenance without sufficient records is maintenance without cost control. Without cost details showing where maintenance money is spent, the most beneficial areas within which to concentrate cost reduction study do not become apparent and too little may therefore be done at the points where maximum improvement might be achieved.

Basis of the entire system devel-

Fig. 1. All maintenance calls are received by dispatcher located in central maintenance area. Call board, see opposite page, is mounted directly in front of him. Date and time stamp is at left; cabinets for completed job record tickets at right



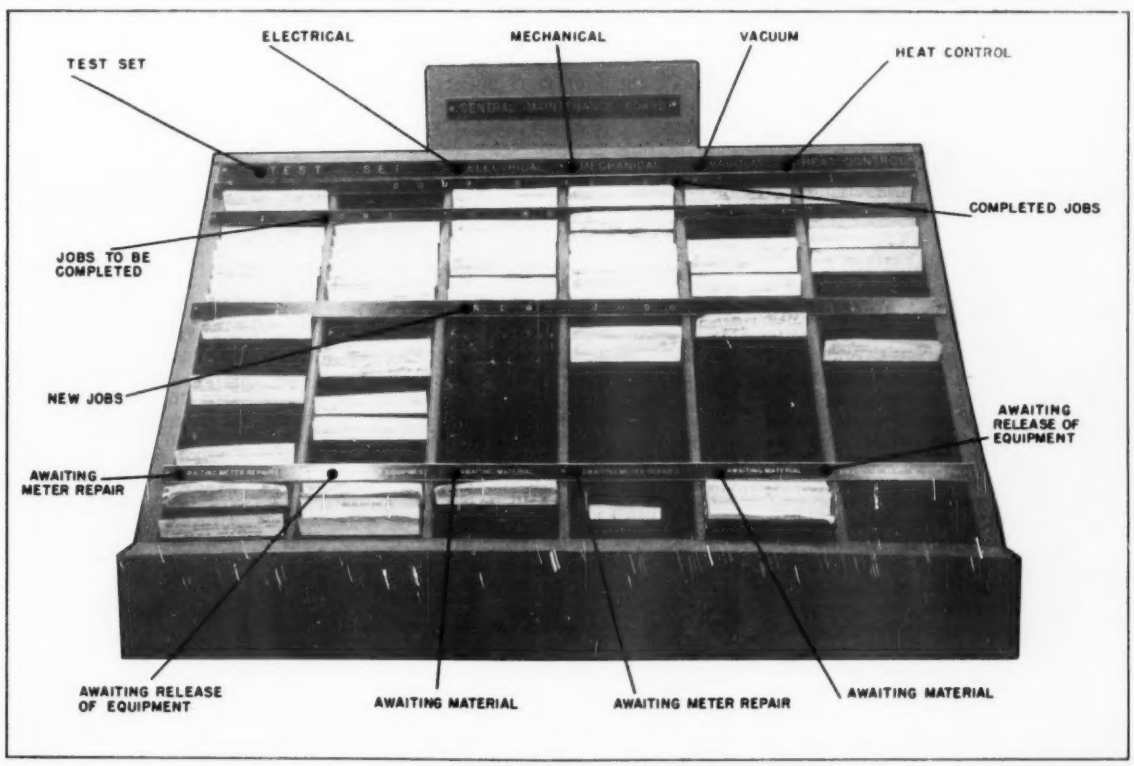
technician with ticket goes to trouble, makes repair, fills out ticket; returns; ticket placed in "completed jobs"; totals posted

oped for use with centralized maintenance at the Allentown Plant is the job ticket and dispatching center. In devising this system, two very important premises were strictly adhered to. These were (1) that most maintenance workers are allergic to the keeping of records, especially if they are somewhat complicated and (2) that if the ratio of clerical to productive maintenance effort were too high, the system would fail of its own weight. To be sure, there is no painless way to keep records without some expenditure of effort, but the number and simplicity of entries to be made by the men can be kept to a minimum consistent with the results desired. An understanding of the way the system operates in actual practice can best be obtained by a specific illustration.

Here's an Example:

Let us assume that John Doe has a piece of test equipment in the tube shop which fails to operate at 7:15 a.m. He dials extension 436, (the maintenance dispatcher's telephone —See Fig. 1) giving him the identification number and location of the equipment involved and the nature of the trouble, together with his name and the department for which he is calling. The dispatcher records this information on a 3 in. by 5 in. maintenance job record ticket (See

Fig. 2. This is central maintenance board showing categories into which job tickets are placed from origin until completion



Replaced defective tubes in plate supply and preheater supply. Adjusted and checked operation. Set OK.
P.R.H.

1952 DEC 23 AM

AP 218-C					
10-2	4113	Perkins	321	Hoppy	1-589
LOCATION	DEPT.	REQUESTED BY	EXT.	WORK DONE BY	EBE NO.

JOB DESCRIPTION Planar Triode Test Set
E_B control inoperative.

MATERIAL	COST				
			RECEIVED	1952 DEC 23 AM	DATE 29
2-5U4 Tubes	3	00	ASSIGNED	7:30 AM	12/23/52
1-6SJ7 "	1	65	COMPLETED	9:00 AM	12/23/52
1-6L6 "	2	90	TOTAL TIME ON JOB	1 ½ hrs.	
2-NE16 "		46	DOWN TIME	1 ½ hrs.	
			CHARGE NUMBER	C-277-4113	

MAINTENANCE JOB RECORD

Fig. 3a Left: Maintenance man shows, on the back of the job ticket, just exactly what he did to effect the repair

Fig. 3b Below: Maintenance job ticket has provision for recording data on where and for what purpose maintenance is requested, time request is received, as well as starting and completion time of job, and kind, amount and cost of maintenance material used

Fig. 3b), indicating the date and time the call is received, and places the ticket on the "call board."

Referring to Fig. 2, you will note that the call board is divided vertically from left to right into five categories requiring different trades; (1) test set mechanical, (2) electrical, (3) mechanical, (4) vacuum, and (5) heat control. Each of these columns is further divided into three sections; (1) new jobs, (2) jobs in process, and (3) completed jobs. Spaces are also provided along the bottom of the board for tickets on equipment awaiting material, awaiting release of the equipment by the operating organization or awaiting meter repair.

Diagnoses Trouble

Now, back to the dispatcher who recognizes John Doe's trouble as a fault in a test set and places the ticket in the "new jobs" section of the board under the heading "test set." Within a short time, the ticket is picked up by the next available test set technician who signs his name to the ticket, leaves the duplicate copy with the dispatcher and proceeds to John Doe's area to remedy the trouble. If he finds that the job is a large one, or requires the help of another type of tradesman, the test set man has such assistance available by calling extension 436 and indicating his needs to the dispatcher.

In John Doe's case a supply voltage is found to be low and the trouble is corrected by replacing a defective rectifier tube. Thus, because of the availability of a skilled technician with a minimum of delay, John Doe's testing operation is back in service by 7:45 with a loss of only ½ hour to the operating organization.

What is the cost of this service to Mr. Doe's department? The mechanic who did the job recorded the starting and completing time, the material used and its cost, and on the reverse side of the ticket a brief but adequate description of the repairs made. (Fig. 3a) The operating department is charged only for the time of one mechanic for ½ hour plus the cost of the rectifier tube. This cost is small compared to John Doe's cost to keep one or more general maintenance men in his area at all times.

After satisfying this request the ticket is returned to the dispatcher who places it in the section labeled "completed jobs" and removes from the board the duplicate which during the repair time was filed under "jobs in process." At the end of each shift all "completed jobs" tickets are removed from the board for posting and filing.

From the tickets the following information is totaled daily by shifts:

1. Number of calls for maintenance, itemized by trades (whether test set, mechanical, electrical, etc.)

2. Total hours of maintenance labor by trades.

3. Total equipment "downtime." Downtime represents production or testing time lost by the shop as a result of the loss of service of that particular piece of equipment. It does not include the time equipment is out of service if the shop has substitute equipment or the time equipment would not be in use had it been available.

4. Total cost of material used by trades.

After posting, the tickets are filed according to equipment number and date. This provides a record of the unit cost of maintenance and a complete history of the work done, modifications made and a record of all "out of service" time for any particular piece of equipment.

Up to this point there has been no mention of what is perhaps the most important phase of this program at the Allentown Plant, namely, "Preventive Maintenance." All equipment (test, mechanical, electrical, vacuum, and heat control) is checked periodically by experts trained in this specialized field of work. The interval between checks is determined by the performance record of the equipment and statistical quality control methods are used to determine when a machine or test set is "out of tolerance."

Ticket System

Defects found by this routine checking program are reported to the dispatcher and handled much the same as a shop call for regular maintenance service. The person making this check also makes the required entry on a job showing the time spent and the results of the inspection.

Since all maintenance tickets are printed from the same plate, a system of colored tickets has been devised to facilitate simple analysis of the data and easy identification of the category into which the tickets fall even when viewed in their position in a file drawer. Time spent making a scheduled inspection is recorded on a pink ticket. The preventive maintenance work done correcting a defect reported by this inspection is recorded on a buff colored ticket. Test set maintenance as requested by the shop is recorded on a white ticket, mechanical maintenance work on a blue ticket and all other work on green tickets.

With this system, a group of tickets comprising the maintenance record on any specific unit of equipment can be analyzed at a glance with regard to such questions as: (1) Are there more test set or more mechanical calls on this equipment? (Number of white versus number of blue tickets.) (2) How often is it inspected? (Number of pink tickets.) (3) How many defects are found as a result of these inspections? (Number of buff tickets compared with the pink tickets.)

The individual filing these tickets is trained to spot what are usually called "hospital cases" or possible hospital cases. This is done by noting the frequency of attention given to various pieces of equipment or the accumulation of an excessive number of buff colored tickets. (Fig. 4)

These tickets are marked by attaching a paper clip to the group at the time of filing and are later brought to the attention of the responsible supervisor. The details of the records can then be carefully scrutinized with the objective of determining the cause of excessive maintenance and a remedy prescribed.

Excessive maintenance cost may be due to (1) improper maintenance, (2) abuse of the equipment, or (3) a design weakness. If it is due to item (1), the corrective action is taken by the maintenance organization; if due to item (2), the operating supervisor is requested to correct the condition causing abuse and if due to item (3), the engineering department is requested to make the necessary improvement in design. In cases where the equipment is worn beyond economical repair and has completed its useful life, the engineering department is requested to procure a replacement.

Relative simplicity of the maintenance job record ticket and the simple, forthright method of having it filled out at the moment that the request for maintenance service is made, contributes in a large measure to the success and accuracy of our results data. It is believed that the goal of minimum paperwork for the individual mechanic has been achieved by transfer of almost all of the record keeping to a central clerk with a single set of files from which all pertinent information concerning the maintenance job can be easily obtained.

At this point, the reader might logically ask "Isn't it an enormous job to list and schedule all the important points to be checked for preventive maintenance attention when there are so many pieces of equipment in the modern plant?" The answer is obviously "yes," but our advice is "Don't worry about it."

Always inspect and repair on the "first things first" basis and the minutiae won't matter.

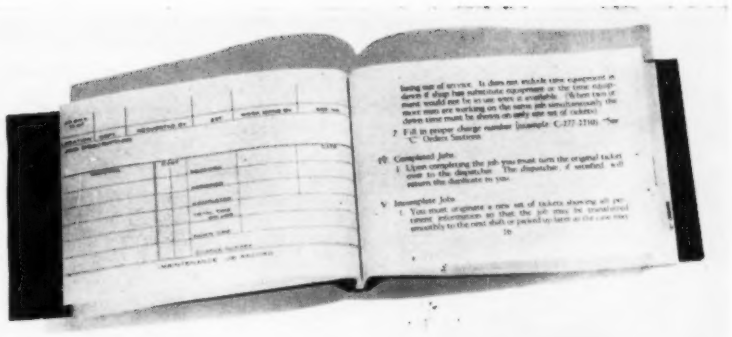


Fig. 5. Convenient pocket-size manual of instructions, including sample job tickets, is given to each individual in maintenance organization so that all may have uniform understanding of procedure which is necessary for full cooperation

Maintenance Manual

Of prime importance in perpetuating the successful operation of even a simple system such as this is the proper instruction of all personnel involved in the required attention to details. Accordingly, a central maintenance manual, Fig. 5, of convenient pocket size was prepared to provide a ready reference to the specific direction needed by all members of the maintenance organization including the dispatcher.

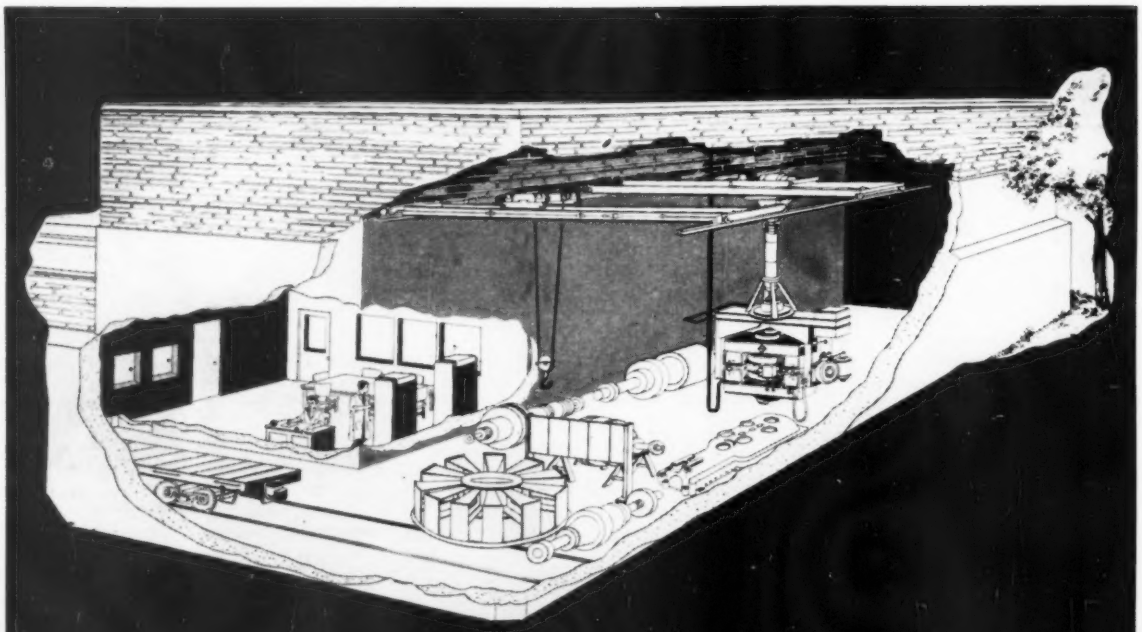
The presentation of the manual to each man at the time of his arrival in the Maintenance Department is an important part of the program. This occasion is taken as an opportunity to "sell" the system to the maintenance man; to tell him why it is necessary and what it will do to improve the quality of his work and to reduce maintenance costs. Particular emphasis is placed upon his integrity in filling out the job ticket.

With this in mind, the maintenance man is assured by his supervisor that his job tickets will not be used as a means of measuring his performance. On this point the man must have confidence in his supervisor. This is not to imply that there aren't means for such measurement, but other yardsticks should be substituted. This assurance has resulted in some peculiar and sometimes humorous entries on the job ticket, such as "20 minutes looking for boss," but more often it has led to conditions requiring corrective action that would not have been revealed in any other way.

Some of the central information which the maintenance-results organization obtains in conjunction with the operation of the dispatching system includes the file of job-record details, and the reports on cases needing abnormal attention. In addition, a file is kept by equipment number wherein all pertinent information is filed for each item of equipment that has been considered a particularly troublesome case or has required special attention for any reason. Records are also kept of the special materials which are ordered, and for what equipment, so that when such material is received it will be promptly installed where needed.

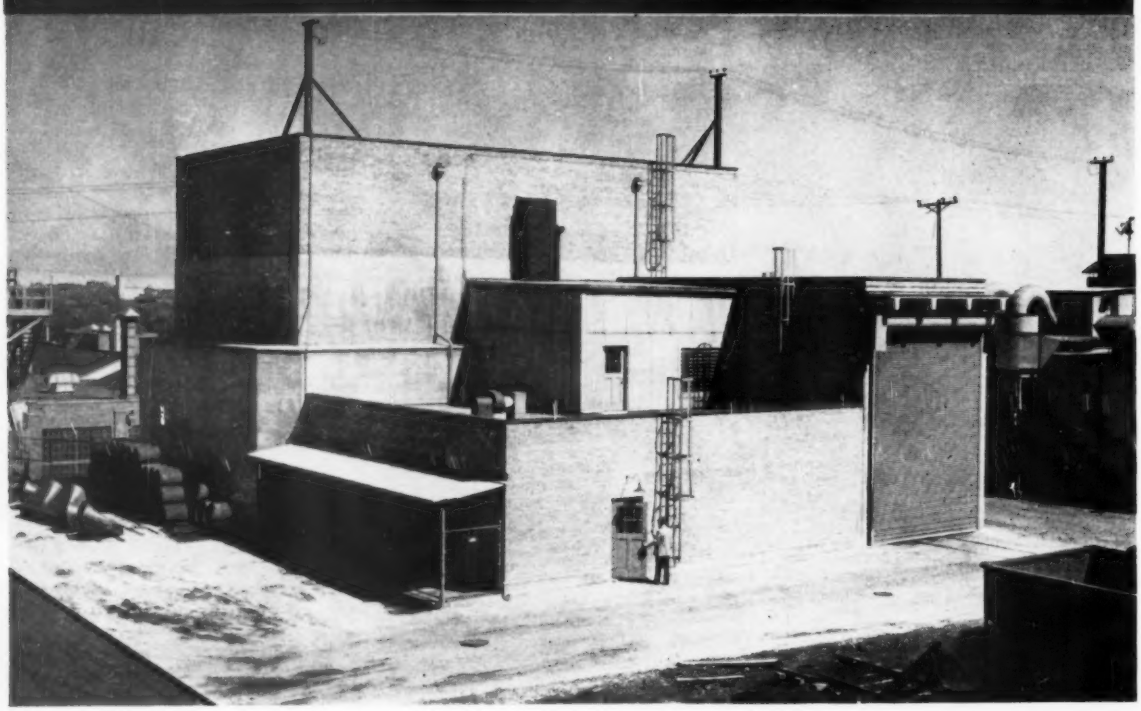
With this centralized maintenance and dispatching system, all of the basic detailed information on where maintenance money is spent and for what purpose it is spent is obtained with no duplication of clerical effort, no preparation of unnecessary records, and almost complete elimination of paper work for the individual maintenance employees.

Fig. 4. Close-up view of file drawer containing completed job tickets on each item of equipment. Volume of slips contained in each group is indicative of frequency of troubles requiring adjustment or repair. Hence, facilities which need excessive maintenance attention can be detected by examination of size of ticket groups



Construction Features of A-C's New Non-Destructive Test Building

By CARL E. MEYER, Manager, Buildings and Properties, and
LLOYD DINGS, JR., Special Engineer,
Both of Allis-Chalmers Mfg. Co., Milwaukee



Six-foot thick, twenty-foot high walls in this new, model betatron inspection facility created special problems . . . Poor soil conditions called for massive footings, monolithic walls required special pouring techniques and equipment . . . Safety precautions . . . Services of building used by other manufacturers

MONOLITHIC WALLS, cast with 947 cu yd of concrete in 33½ hours, form the protective walls of a model betatron laboratory recently completed at the West Allis Works of the Allis-Chalmers Manufacturing Company. The laboratory, built to facilitate X-ray inspection of heavy steel castings and forgings, has 6-ft thick, 20-ft high walls to protect radiographers from lethal, high energy beams of the 22-million-volt betatron.

In order to apply the advantages of the betatron for industrial radiography, special consideration in planning a laboratory for its use was required. Since only one or two minutes are required for radiographs of sections up to 12 in. in thickness and only a few hours are required to radiograph sections ranging up to 24 in., the problem in planning a betatron laboratory, then, was to provide an efficient work-handling arrangement. Also, because of the high energy and intensity of the beam, ample protection was considered necessary for the laboratory personnel.

Laboratory Site

Of the available sites, a fill of waste foundry sand on a bluff on the edge of the shop yards was chosen for the model laboratory. This location has the least ground vibrations from shop presses and hammers.

Site chosen was a compromise in regard to the nearness to other activities and is convenient for work haulage by rail or motor truck. It is isolated to the extent that the requirement for insulation from radiation for the surrounding areas is not excessive.

The laboratory is divided into four areas. These are (1) the X-ray bay, (2) rail tunnel, (3) auxiliary rooms and (4) a penthouse. The rail tunnel provides access to the X-ray bay and forms an "L" with it. The auxiliary rooms are inside the "L" and the penthouse is above these rooms. The inner measurement of the X-ray bay is 34 ft 6 in. by 61 ft 8 in., while the tunnel is 17 ft by 47½ in. in size. The bay wall opposite the office area is 4½ ft thick, since it is the one facing the bluff. The remaining three walls are 6 ft thick. These measurements are carried to a height of 20 ft above the floor, corresponding to the maximum vertical travel of the betatron.

Outer wall of the rail tunnel is 6 ft thick where it joins the bay wall and tapers to 1 ft 8 in. at the door end. The reduction in thickness was permissible because the intensity of the X-ray beam lessens as the distance from the source increases. Since the opposite wall of the tunnel is not subjected to direct radiation a thickness of only 1 ft 4 in. was necessary.

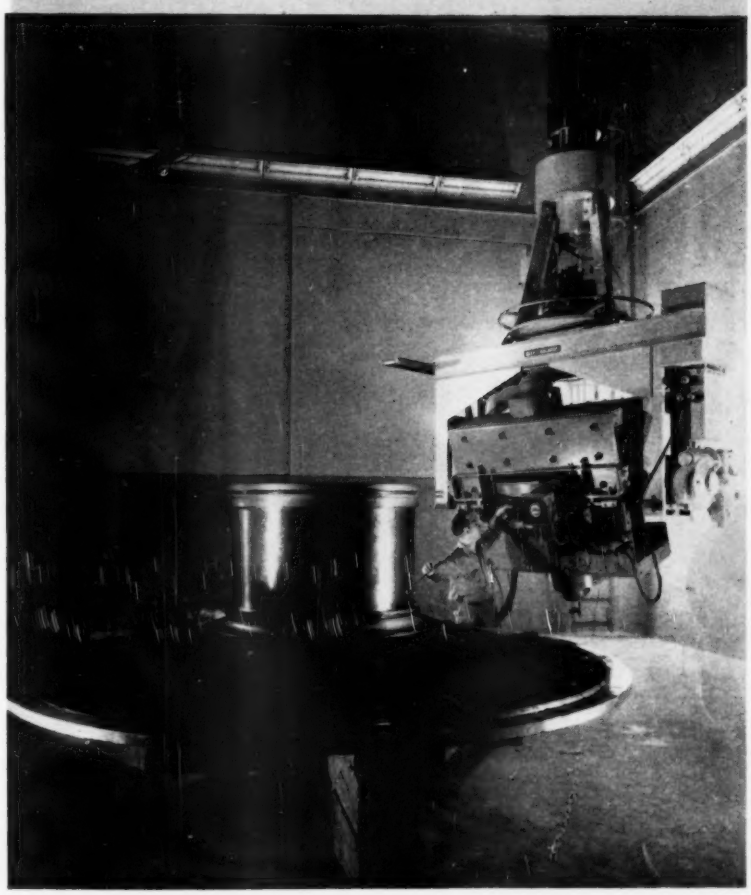
Footing a Problem

Because of the poor soil conditions, a massive footing was provided for the walls of the X-ray bay to prevent their sagging and cracking. This precaution as well as the monolithic casting was necessary to insure complete imperviousness to radiation. The foundation is constructed of 2½-ft thick reinforced concrete in a spread footing design. It rests 6 ft below grade and is 13 ft wide for the 6-ft thick walls, 10 ft wide for the 4½-ft. walls.

Forms for the bay walls were faced with Masonite for the interior surface and with plywood for the exterior surfaces so that these surfaces would present a smooth appearance. Following the pouring, when the forms were removed, the tie rods used for spacing the forms were burned off and the cavities repaired to continue smooth finish.

A heavy grid of reinforcing steel was placed near the outer surface of the walls to take up the stress caused by temperature variations. This construction binds the 1650 tons of concrete together.

View inside betatron laboratory showing inspection of welded joint of a trunnion and head. Betatron is suspended from its own crane by a telescoping tube which provides for vertical or rotary motion of the betatron. Unit may be moved to any part of the laboratory by means of a pendant crane control



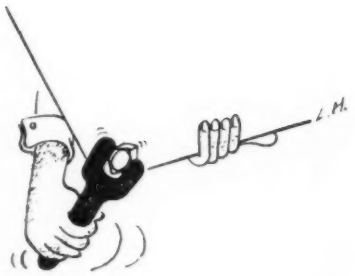
One contracting firm handled the construction of the laboratory. To cast the walls they used ready-mixed concrete and began pouring early in the morning, continuing around the clock until the following noon. Using a crane and bucket, the crews poured progressively around the forms so that the concrete would knit together. A rapid procession of trucks to and from the site hauled the concrete.

After the concrete had set and the forms were removed, the crews began the superstructure of the X-ray bay and the walls of the auxiliary rooms. The superstructure consists of a concrete wall 2 ft 8 in. thick to support the bridge cranes and a brick wall that supports the roof. The exterior walls of the auxiliary rooms are also brick, 12 in. thick. The wall encloses the control room, office, viewing room, darkroom, capacitor room and locker rooms. Metal lath and plaster form the partitions and ceilings for these rooms.

Interior walls of the entire building are attractively decorated with rubber-base paint. The roofs of the laboratory consist of structural steel beams and purlins, precast lightweight concrete decking, insulation and built-up 3-ply roofing. The floor of the bay and tunnel is a 12-ft thick reinforced concrete slab laid on the ground. A drain is locted in the tunnel floor to remove snow and rain brought in with castings and also to aid in cleaning the floor. Floors of the auxiliary rooms are 6-ft thick reinforced concrete slabs also laid on the ground and are covered with asphalt tile flooring.

Housing the heating and ventilating equipment is a penthouse above the control room and adjacent to the upper wall of the bay. Penthouse walls are constructed of corrugated asbestos-cement siding fastened to structural steel framing. The betatron power supply transformers, located in a wire enclosure outside of the north wall of the building, are sheltered by a corrugted asbestos-cement roof. The betatron capacitor racks, located in the corner of the building nearest the transformers, are enclosed in a cabinet provided with forced ventilation.

View of forms for pouring the superstructure shows thickness of walls; 947 yd of concrete poured in 33½ hours. Poured in cold weather it was protected with canvas



Work, hauled between the shops and the laboratory by either rail or truck, is brought into the bay through the tunnel. In the bay, a 25-ton heavy-duty bridge crane was installed to handle the work. The betatron itself, supported by a 7½-ton bridge crane, is arranged so that it can be moved over the entire floor. This arrangement is necessary since the pieces handled range up to 20 tons in weight and are irregular in shape.

Safety Precautions

Careful thought was given to safety requirements in arranging the controls of the machine. Limit switches, interlock switches, and warning devices were installed to make its operation as foolproof as possible. A key operated master switch, installed in the bay, provides anyone caught in the bay a means of making the machine inoperative.

The control room is free from radiation hazard even though it is adjacent to the tunnel. The darkroom and the film passbox are also close to door leading into the bay.

Even the darkroom is a model facility. The equipment is stainless steel and is arranged for maximum convenience. Since the volume of film handled is not large, almost no automatic equipment is used. The film dryer is installed so that it also serves as a passbox.

This installation was completed and put into operation during the summer of 1952. Since that time a large amount of work has been handled and the equipment has proved wholly satisfactory. With the facility, the company is able to make a 100 per cent inspection of all important castings and forgings. It is estimated that the savings in machining work resulting from the detection of flaws by the betatron during the first six months of operation has paid for the laboratory.

Use of the facility has been extended to neighboring manufacturing companies, and as a consequence the laboratory has a constant backlog of work. In addition to its practical work, the laboratory is also used for experimental developmental work in the field of radiography. From this have come new uses for the betraton and applications for industrial radiography.

Effective PM Program for INDUSTRIAL TRUCKS

Developing proper attitude among maintenance men . . . Importance of correct lubrication and good lubricants . . . Principal causes of equipment failure and breakdown . . . Vital importance of accurate record-keeping . . . Preventive maintenance chart

By **JOHN A. DRAXLER**, Manager, Service and Field Engineering
The Elwell-Parker Electric Co., Cleveland, Ohio

TODAY, AS NEVER BEFORE, preventive maintenance of industrial trucks is a vital consideration. The proper functioning of such equipment is necessary to produce on schedule, to minimize costs, and to effect maximum company-wide operational efficiency.

Present day production incentive systems may also place an undue strain on handling equipment. For example, the operator of an industrial truck, who is under some sort of an incentive system, may be inclined to overlook correct preventive maintenance regulations in favor of continued operation with accompanying incentive pay rather than standby pay.

The lack of an effective preventive maintenance system and/or the lack of a desire to keep equipment in top operating condition, can cause excessive downtime not only to the handling equipment itself, but can also cause the tieup of normal plant operations.

The purpose of this article is to set forth certain basic rules for establishing an effective, workable maintenance program. Of primary importance is the question of authority. The maintenance department must have sufficient authority to enforce the program. All too often a good maintenance system falls by the wayside because the production departments will not permit trucks to be pulled out of service for repairs. Although this is an understandable attitude it does not help to keep truck operating costs down.

There are two possible solutions to this problem: (1) Provide a standby truck which can be placed in service while inspection and repairs are made. (2) Permit the maintenance department to work a different shift from the production departments. Although either of these solutions cost money, many plants have found that the reduced truck maintenance has made up the difference many times over.

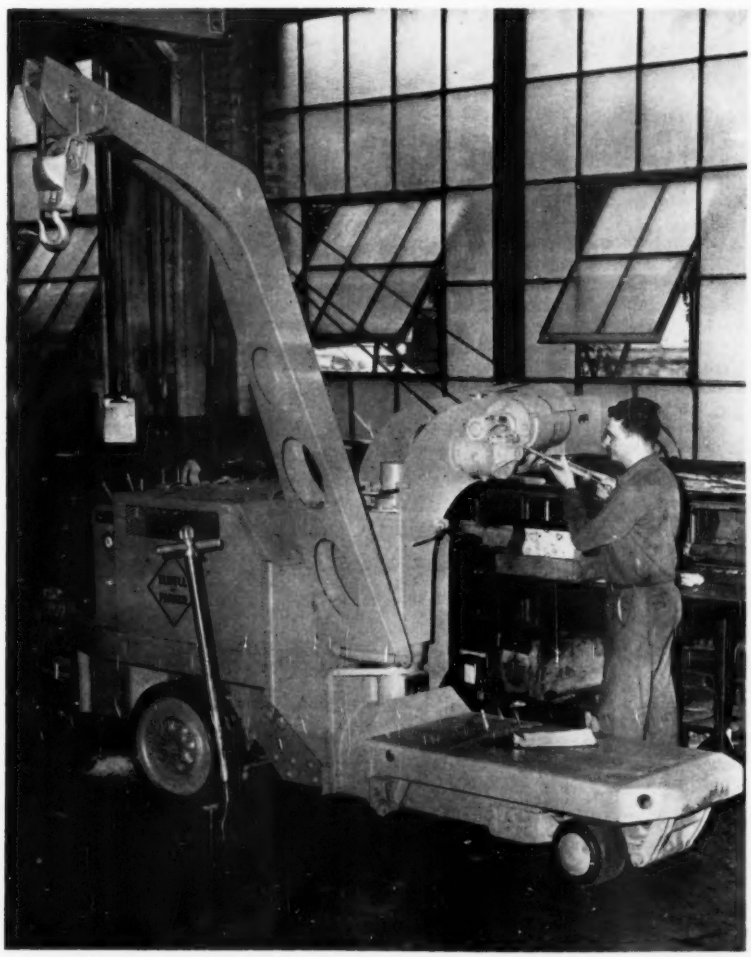


Fig. 1. A well-equipped maintenance shop, staffed with intelligent, cooperative maintenance men helps to insure dependable, low-cost truck operation. Manufacturers' recommended lubricants, used regularly, are insurance against breakdown

Who Services Your Trucks?

No matter what the make or type truck, certain standard preventive maintenance regulations will apply. While this material was specifically prepared for operators of electric industrial trucks, it is obvious that many of the rules concern gas-powered trucks as well. But for any type truck, when in doubt, it is vital to consult with the representative of the manufacturer who sold the vehicle in question. In addition, handbooks are normally provided to cover maintenance information peculiar to a given vehicle.

Without the proper attitude, maintenance men can cause more harm

(Continued on page 97)

Preventive Maintenance Chart

Following is a list of preventive maintenance check points which will adequately cover almost any type of electric-powered truck. It is based on the maintenance needs for a truck operating under average plant conditions. If your operating conditions are light, greater time can be allowed between inspections. If your conditions are severe, inspections should be made more frequently. The manufacturer of your truck can help you adjust your inspection schedule to suit your own particular requirements. Keep in mind that certain industrial truck applications place an undue strain on certain parts of the truck. In this case, it may become necessary to inspect these heavily worked parts more often.

Since the check list is designed to cover a variety of electric truck types each schedule is divided into a general section covering points to check on all types of trucks, plus a list of additional items applying to a specific type of truck. Be sure to include all the check points shown on the previous schedule as well as those shown on the later schedule, i.e. after 1000 hours of operation check those points shown on schedules A and B in addition to those shown on schedule C.

Preventive Maintenance Check List—Electric Industrial Truck

50 HOURS' SERVICE OR WEEKLY SCHEDULE A

GENERAL (For All Truck Types)

- Check Oil Level in Drive Axle
- Check Service Brake
- Check Steering for Backlash or Binding
- Check Parking Brake
- Check Warning Signal
- Visually Inspect Frame, Skirts, etc. for Damage
- Inspect Tires for Cracks, Chips and Other Defects
- Lubricate. See Manufacturer's Maintenance Manual
- Test and Inspect Battery Receptacle
- Road Test Truck

FORK TRUCKS

- Check Oil Level in Hydraulic Tank
- Check Hoist and Tilt Cylinders for Leakage
- Check Hydraulic Hose Fittings for Leakage
- Check Pressure Gage (when used)
- Check Pressure Adjusting Switch (when used)
- Check Pressure Check Valve (when used)
- Test Hydraulic Relief Valve
- Test Function of Attachments
- Check for Damaged Forks

LOW LIFT PLATFORM TRUCK

- Inspect Platform Lift Linkage
- Check Trail Wheel Bearings for Lubrication and Wear
- Check Oil Level in Lift Mechanism
- Inspect Universal Joints

HIGH LIFT PLATFORM TRUCKS

- Inspect Lift Chains
- Check Trail Wheel Bearings for Lubrication and Wear
- Check Oil Level in Hoist Mechanism
- Inspect Universal Joints

CRANES

- Inspect All Cables
- Check Oil Level in Boom, Hook and Slew Reduction Units
- Test Boom and Hook Limit Switches
- Inspect Universal Joints
- Check Cable Drums
- Inspect Boom for Mechanical Damage

250 HOURS' SERVICE OR MONTHLY SCHEDULE B

GENERAL (For All Truck Types)

- Check All Points Listed in Schedule A
- Check Oil in Brake Master Cylinder (hydraulic brakes)
- Check Clearance of Brake Shoes (mechanical brake)
- Check Oil Level in Steering Gear Housing
- Check Function of "Dead-Man" Control Interlock (seat or pedals)
- Check Horn Button
- Check Operation of No-plug (when used)
- Blow Dirt Out of Truck with Compressed Air
- Blow Out Motors with *Dry* Compressed Air
- Blow Out Controllers and Contactors with *Dry* Compressed Air
- Blow Out Resistance Boxes with *Dry* Compressed Air
- Check All Motors—Commutator and Brushes
- Check Controllers and Contactors. Replace Tips as Required.
- Service Battery. See Battery Maintenance Instructions.

FORK TRUCKS

- Check Hoist and Tilt Cylinders for Excessive Drift
- Check Chain Reeving
- Clean Strainer in Hydraulic Line (if used)
- Check Master Controller for Speed Sequence
- Check Uprights and Elevator Carriage for Strain or Damage

LOW LIFT PLATFORM TRUCKS

- Check Operation of Controller Linkage
- Check Steering Linkage
- Inspect Platform for Damage

HIGH LIFT PLATFORM TRUCKS

- Inspect Uprights and Elevator Carriage
- Check Steering Linkage
- Check Operation of Controller Linkage
- Check List Mechanism Brake Lining
- Lubricate Lift Chain

CRANES

- Check Steering Linkage
- Check Controller Linkage
- Inspect Slewing Mechanism
- Inspect Boom and Hook Hoist Mechanism
- Check Boom and Hook Hoist Brake Lining
- Lubricate Cables

1000 HOURS' SERVICE OR EVERY FOUR MONTHS SCHEDULE C

GENERAL

- Adjust Steering Unit for Minimum Backlash
- Check and Repack Wheel Bearings
- Check Wheel Bearing Seals
- Check All Wiring for Loose Connections or Grounds
- Wash and Touch Up Truck
- Repair Bent or Damaged Skirts, Battery Compartment Doors, etc.
- Drain and Refill Drive Housing
- Check Resistor Grids

FORK TRUCKS

- Check and Service Pump Operating Switch
- Check Elevator for Excessive Play
- Check Inner Uprights for Excessive Play
- Service Hydraulic Pump
- Inspect and Lubricate Elevator and Upright Rollers
- Drain, Flush and Refill Hydraulic Tank
- Clean and Service Control Valves

PLATFORM TRUCKS

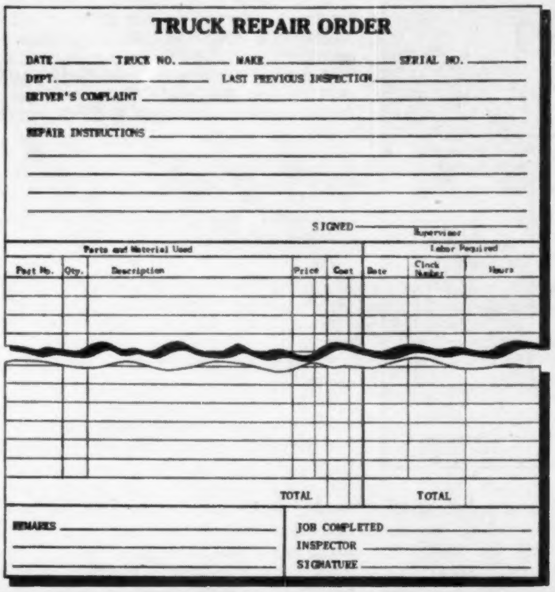
- Drain and Refill Lift Mechanism Housing
- Check and Service Auxiliary Switches

HIGH LIFT PLATFORM TRUCKS

- Drain and Refill Hoist Mechanism Housing
- Check Uprights for Excessive Play
- Check Lift Chain Tension
- Lubricate Uprights and Elevators

CRANES

- Replace Worn Cables
- Drain and Refill Slew Unit Housing
- Drain and Refill Hook Hoist Housing
- Drain and Refill Boom Hoist Housing
- Inspect and Lubricate Slew Bull Gear Housing
- Check Slew Unit Bearing Adjustment



TRUCK REPAIR ORDER

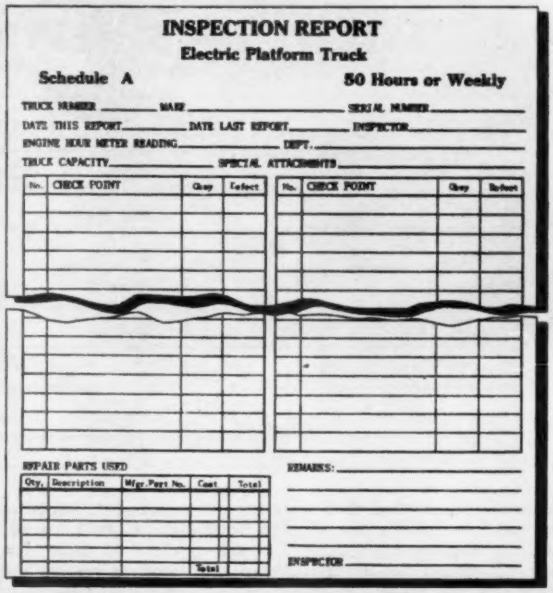
DATE ______ TRUCK NO. ______ MAKE ______ SERIAL NO. ______
DEPT. ______ LAST PREVIOUS INSPECTION ______
DRIVER'S COMPLAINT ______
REPAIR INSTRUCTIONS ______

SIGNED ______ Supervisor

Parts and Material Used					Labor Required		
Part No.	Qty.	Description	Price	Cost	Date	Clock Number	Hours
			TOTAL			TOTAL	

REMARKS ______
JOB COMPLETED ______
INSPECTOR ______
SIGNATURE ______

Fig. 2. Since an accurate accounting of operating costs is necessary, a form such as this will simplify recording of labor and parts costs. Upon completion of a job totals should be footed, labor costs determined, and costs posted to the ledger so annual or bi-annual costs can easily be made



INSPECTION REPORT
Electric Platform Truck
Schedule A 50 Hours or Weekly

TRUCK NUMBER ______ MAKE ______ SERIAL NUMBER ______
DATE THIS REPORT ______ DATE LAST REPORT ______ INSPECTOR ______
ENGINE HOUR METER READING ______ DEPT. ______
TRUCK CAPACITY ______ SPECIAL ATTACHMENTS ______

No.	CHECK POINT	Okay	Defect	No.	CHECK POINT	Okay	Defect

REPAIR PARTS USED

Qty.	Description	Mfgr. Part No.	Cost	Total
			Total	

REMARKS: ______
INSPECTOR ______

Fig. 3. Systematic procedure for truck inspections at regular intervals is basic to any good PM program. Check points should be selected on basis of experience but the accompanying chart can serve as a basic guide. Similar forms should be available for monthly and quarterly inspections

than good. Interestingly enough, our field men report three markedly different general attitudes. Perhaps you will recognize your maintenance man in one of the following classifications:

1. First, there is the maintenance man who is afraid of the electric controls of a truck. He doesn't really understand the basic functions that govern the operation of electrical equipment; consequently, when something goes wrong, he "guesses" that changing this or that will end the trouble. Needless to say, it normally does nothing of the kind.

There is no need to be afraid of electrical equipment. It is simple to handle and simple to keep in perfect operating condition if the maintenance man will learn the few basic facts that are required and will then follow up his knowledge.

2. Second, there is the maintenance man who contemptuously regards hydraulics and electricity as too simple to require any thought on his part. He has always been able to fix anything with a hammer, a wrench, a screw driver, and some wire, and he feels that by the same token, he ought to be able to maintain a simple electric truck in the same way.

3. Third, there is the maintenance man who recognizes the electric controls system as a highly important contribution to the efficiency of modern machinery. Such a maintenance man knows that the operation of his truck is controlled by certain principles just as is true of any mechanical piece of equipment.

Obviously, it is of utmost importance to have the best trained and equipped personnel in charge of a truck maintenance program. These men may save you money by efficient maintenance or they may cost money by the improper discharge of their duties. Maintenance men must understand the great responsibility that rests within their hands and must be constantly reminded of the great importance of their job. They also must be supplied with the latest information on effective truck maintenance and must be equipped with modern servicing equipment.

Importance of Lubrication

How often are your trucks lubricated? Are they lubricated on a specific schedule? If you answer "I don't know" to the first question and "No" to the second, chances are you are not maintaining your trucks properly.

One of the most important factors in the successful operation of industrial trucks is the use of properly selected lubricating oils and greases and a regularly scheduled lubricating interval. If the truck is of the hydraulic lift type, the selection of the proper hydraulic oil is also of vital importance. It is also important to establish a regular inspection and adjustment schedule. Such a program will normally catch a minor equipment breakdown before it develops into a major failure that is costly to repair. A suggested list of inspection points is given elsewhere in this article.

One question that is often asked is—"If regular inspection is so important, why aren't specific inspection charts supplied with each industrial truck?"

Mainly, the frequency or interval of inspection and adjustment are governed by many factors which are not known to the manufacturer.

These factors include: the general conditions of the floors or roadways over which the trucks operate; the size and type of loads; the conditions of the atmosphere, whether dusty, damp, hot or cold; the nature of the service cycle, whether it consists of long runs or short runs with an abnormal amount of jockeying; the actual hours a day in which the truck is in service; the relationship of the location of the service center to the truck operating and storage area; the type of operator and whether the truck is assigned to one operator only or used by several; the maintenance facilities available.

Since these and other related factors are known and controlled by the operating and maintenance departments of a company, it seems logical to assume that any effective preventive maintenance program must be worked out with the direct cooperation of responsible parties in these departments. The service and field engineers of the manufacturer of an industrial truck are always eager to assist in working up such a program which will be correlated to the conditions and facilities existing in a given plant.

Here are a few of the principal general causes of equipment failure and breakdown. Some of these, however, fall outside the jurisdiction of many maintenance or electrical departments: 1. Neglect of minor re-

DAILY TRUCK REPORT

TRUCK NO. _____ DATE _____ SHIFT _____

OPERATOR _____ DEPARTMENT _____

Check	O.K.	Def.	Check	O.K.	Def.
Brakes			Seat Brake		
Horn			Tires		
Steering			Hoist		
Controller			Tilt		
Forks					

SIGNED _____

Fig. 4. Daily truck report is filled out by truck operator at the start of each shift; this gives maintenance department close check on major operating and safety features of each truck and repairs can be made before damage becomes more extensive and expensive

pairs and inspection; 2. Faulty lubrication; 3. Overloading; 4. Bad floor and/or roadway conditions; 5. Careless operation by inexperienced or irresponsible operators.

Neglect of minor repairs and faulty lubrication may be largely corrected by periodic inspection, and others by proper supervision and foresight. Overloading can be and must be prevented by constant supervision because such practices may cause a truck to "let go" without warning, causing severe damage to equipment and loads and even severe injury to personnel.

Bumps Damage

It is important that roadways and floors be kept clean and in good repair, free from oil or grease, especially at aisle intersections where several trucks may be passing repeatedly. Uneven floors and roadways can and do cause serious damage to truck and load.

Careless and irresponsible operators can easily cause more damage to a truck, its load, and surrounding property than is usually known. Drivers should be properly educated on the correct way to operate an industrial truck and should be given a regular course of instruction before they start on the job.

Operators should be trained to report the following factors to their foreman or supervisor. These are usually the danger signs which if caught in time can save costly repairs: 1. Decrease in normal speed; 2. Lack of power; 3. Apparent lack of proper lubrication; 4. Worn or damaged tires; 5. Poor brakes; 6. Missing parts such as hub caps, covers or the like; 7. Worn or partly broken wire ropes or chains, broken or bent operating rods, etc.; 8. Difficult steering.

It is not, of course, good policy to depend altogether on the operator to call attention to major or even minor items which have a bearing on preventive maintenance. A better plan is to schedule regular periods for inspection and lubrication, the time interval depending on the class of work done by the truck as well as on working conditions. The outline of such a maintenance schedule is included elsewhere with this article. It is intended as a guide for all service departments, but again, may be altered by existing conditions. As stated previously, the final judge of all maintenance problems is the manufacturer of the trucks.

Finally, it is important to make sure the truck is in good mechanical and electrical condition, is properly lubricated and that all safety features are working perfectly before returning it to regular service at the start of each shift. Also, order expendable repair parts in advance of their actual need—for example, contact tips, tires, lubricants, oil seals, brake linings, small switches, packing, and other known parts which surely will be required sooner or later. There will be other parts of like nature which a maintenance foreman or storekeeper will learn through experience may best be required periodically.

Why Accurate Records?

One vital part of any effective preventive maintenance system is the keeping of accurate operating and repair costs since such records play an important role in reducing industrial truck operation expenditures. Through the intelligent interpretation of these costs, it is possible to adjust the preventive maintenance program to eliminate failures before they occur. And these records may indicate a better training program for operators, changes in the materials handling program to eliminate overloading or other bad practices.

There are many typical examples of how accurate records have reduced operating costs. For example, one plant with a high percentage of bent steering rods traced the difficulty to a bad railroad crossing. Defective floor areas had received no attention for years until maintenance records disclosed how much this seemingly unimportant defect was costing them.

In another plant, maintenance records disclosed that the operating cost for one make truck was much higher than for another make of truck.

Both these trucks were doing the same job. Plant management immediately jumped to the conclusion that the problem truck was inferior. Further checking, however, disclosed that the fault lay with the operator, not with the truck. He drove carelessly, overloaded the truck. A new operator was hired and the operating costs fell into line.

One more example illustrates how accurate records aided in setting up a more effective preventive maintenance program. A firm found through its newly established maintenance cost system that they were having a serious drive axle breakage problem. Cost of replacement axles and the labor to install them formed nearly all of their truck operating expense. A check was made into the cause of this problem and it was found that prior to the axle failure excessive play occurred in the axle assembly caused by worn universal joints. The company conducted a frequent inspection of the universal joints in its preventive maintenance check list, with the result that it now has a $12.00 knuckle replacement job instead of a $150.00 axle replacement.

Regardless of how helpful good maintenance records may be there still remains the problem of how best to obtain the information without excessive, costly paper work. A little planning plus cooperation of the maintenance men who do the job will go far toward implementing such a system.

A form should be provided similar to the one shown in Fig. 2. The mechanics of the form will vary with each company, but it should contain certain basic information—truck identification space for the maintenance supervisor to indicate repair instructions for the maintenance man to follow; a place for the mechanic to indicate quantity and description of parts used; space for labor charges, and provisions for the signature of either the mechanic or supervisor so that responsibility for the work can be determined if a problem should subsequently arise.

Provision should also be made so that the supervisor or his clerk can enter parts and labor costs on the sheet and by adding these come up with a total cost for the entire job.

Plant Improvements "Go Underground" At Falk Corporation

Quickly-uncovered pipe trenches have been constructed in a "look-to-the-future" move . . . New pumps will help keep sewers clean, and will lower plant maintenance costs

By **FOSTER C. KOEHN**, Plant Engineer
Falk Corporation, Milwaukee, Wis.

Fig. 1. Two pumps have been installed in the plant. Their function is to keep sewers clean and prevent flooding, cut sewer cleaning costs and flood damage

ONE OF THE LEAST liked and most expensive chores any plant engineering department can encounter is the unearthing of pipe lines to find a leak. To cut costs of maintenance, speed-up repair work, and facilitate yard materials handling, we at Falk Corporation have put some recent improvements underground.

Primarily, these improvements have consisted of a long concrete trench for carrying steam, air and condensate lines from the power house to the weld shop—considerably removed across a busy yard. There were four basic reasons for the construction:

First, the old lines had outlived their usefulness; they had been underground for 17 years. Many leaks were found and these were not only wasting steam, air and condensate but were expensive to maintain. In addition, constant repairs disrupted service to the weld shop and hindered yard operations.

Second, a larger air line had to be installed so that the compressor in the weld shop could be moved to the power house. Additional air capacity was needed at other points in the plant and it could be distributed more economically from the centrally-located power house.

Third, the old condensate line was completely useless because of leaks. Leakage of treated water and added maintenance cost us $2271 annually.

Fourth, the new steam line was designed for future additions to the weld shop. We now can be assured of proper heating service in the new portion of the shop.

One not inconsiderable saving which is anticipated as a result of these improvements is a reduction in boiler cleaning costs. It figures out this way: Only 57 per cent of the water used to generate steam is returned to the power house as condensate. Of this total 10 per cent of it is returned from the weld shop.

Without this return line our costs for treated water would soar or it would be necessary for us to clean a boiler every two years instead of the four or five year period which we are now experiencing. Cost of cleaning a boiler is $1400.

Fig. 2. This photograph gives a good idea of the length of the trench. Concrete slab will help speed up yard traffic

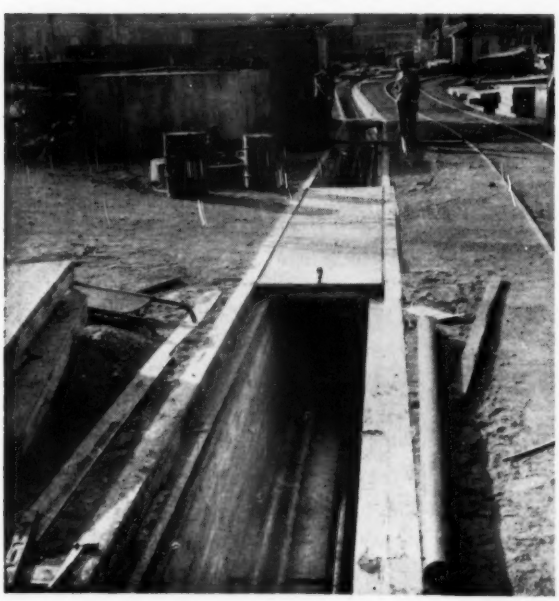


Fig. 3. Here is the place where the trench meets the west wall of weld shop. Removable covers are good time savers

PM Program Thrives on Control

By DANIEL G. JOCZ, Maintenance Superintendent, Beloit Iron Works

CONTROL IS THE BACKBONE of a successful preventive maintenance program. Without it, the best of plans can go astray. Control is the key to success for the Beloit Iron Works of Beloit, Wisconsin. Control makes the company's pm program do the job of keeping its plant in good repair.

First, a study was made by our department, of past maintenance records which showed that many operations were performed repeatedly. A list of these was compiled and the frequency of their repetition was noted along with the last date that a particular operation was performed. The total number of hours involved in the operation was divided by the frequency to establish the average task limit per operation.

Then, a special job ticket, Fig. 1 was designed to carry the following information: week number, (maintenance calendar weeks are numbered consecutively from 1 to 52), frequency of operation, procedure number, and task limit.

After the desired information is entered on the job tickets, they are placed chronologically in a file. At the beginning of each maintenance calendar week, this file is purged of cards which carry the number of that particular week. Information from the purged cards is copied on duplicate cards in a follow-up file.

The purged tickets are sent to the maintenance department for the execution of the work indicated. When the job that the ticket specifies is completed, it is returned to the maintenance office. A corresponding ticket is purged from the follow-up file. A newly made-out ticket, adjusted to the new frequency is placed in the active file and the cycle is completed.

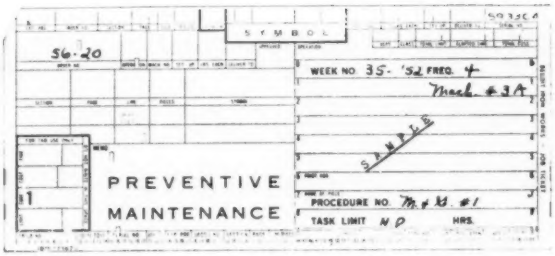


Fig. 1. Sample of paperwork used in pm control program

As an example, let us assume that week No. 14 is in effect. All job tickets in the No. 14 file would be pulled and new tickets would be made. If the frequency on the "14" ticket read "4," the new job ticket for the same operation would have "18" written next to the word "week," (14+4). Thus, the job would be repeated during maintenance calendar week No. 18.

Along with job tickets, inspection schedules such as these on motors and generators are used giving procedure and frequency

INSPECTION FREQUENCY — WEEKLY	
CHECK POINTS	**INSPECTION DETAILS**
Surroundings	Note any dripping water, acid, or alcoholic fumes; also, any unusual amount of dust, chips, or lint on, or about, the motor. See if any boards, covers, canvas, etc., are left about that might interfere with ventilation or jam moving parts.
Sleeve-bearing motors—ring-lubricated, wool-packed, etc.	Where an oil gage is used, check oil level, and if necessary, fill to line on the gage. For special lubricating systems, such as wool-packed, forced lubrication, flood and disk lubrication, refer to instruction book. Add oil to bearing housing only when motor is stopped. See if oil is creeping along shaft toward windings.
Mechanical condition	Motor distress will often show up in unusual noise caused by metal-to-metal contact or in odor from scorching insulation varnish.
Ball or roller bearings	Feel bearing housings for evidence of vibration, and listen for any unusual noise. Inspect for creepage of grease on inside of motor or generator.
Brushes and commutators or rings	Look for sparking. If on cycle duty, watch through several cycles. Note color and surface condition of commutator. Don't neglect any brush. Check all brushes for remaining wear. Check pigtail connections for looseness. Inspect for black spots or roughness developing on commutators or rings.
Rotors and armatures	Check air gap on sleeve-bearing motors, especially if recently overhauled. If new bearings have been installed, make sure that the average air gap is within 10 per cent, if air gap is normally less than 20 mils (0.020 in.).
Windings	If needed, clean by suction or mild blowing. Make sure machine is dead mechanically and electrically. Wipe off dust with dry cloth. Note evidence of moisture. See if any water has accumulated in bottom of frame. See if oil or grease has worked to the rotor or armature windings.
Mechanical inspection	Check belt for suitable slack and surface condition. Look at gears for signs of uneven wear. If flexible couplings are properly lined up, there will be no noise or evidence of excessive use of the flexible factor. See if chains clear housings. Check chain lubrication, especially for excess grease and oil in bottom of housing. See if sprockets show even wear across the teeth. Check motor starting; Report abnormal action.

The inspection instructions are assumed to be applicable generally to industrial plants even though procedure will vary

INSPECTION FREQUENCY — EVERY 1 OR 2 MONTHS	
CHECK POINTS	**INSPECTION DETAILS**
Windings	Check shunt, series, and commutating fields for tightness. Try to move field spools on poles: drying out may cause play. Check machine cable connections for tightness.
Brushes a-c and d-c	Check brushes in holders for fit and free play. Check brush-spring pressure. Tighten brush studs to take up slack from drying out of washers. BE SURE STUDS ARE NOT DISPLACED ON D-C UNITS. Replace brushes that are worn almost to the brush rivet. Examine brush faces for chipped toes or heels, and for heat cracks. Replace any that are damaged.
Commutators	Examine commutator surface for high bars and high mica, or evidence of scratches or roughness. See that risers are clean and have not been damaged in any way.
Ball or roller bearings	On hard-driven, 24-hr service motors, purge grease; apply new grease. Check to make sure grease or oil is not leaking out of the bearing housing. If any leakage is present, correct the condition before continuing to operate.
Sleeve bearings	Look for bearing wear, including end-play bearing surfaces. Clean out oil wells if there is evidence of dirt or sludge. Flush with lighter oil.
Enclosed gears	Open drain plug and check oil for presence of metal scale, sand, or water. If condition of oil is bad, drain, flush, and refill as directed. Rock rotor to see if slack or backlash is increasing (see previous record).
Couplings and other drive details	Note if belt-tightening adjustment is all used up. Shorten belt if this condition exists. See if belt runs steadily and close to motor edge of pulley. Chain should be checked for evidence of wear and stretch. Clean inside of chain housing. Check chain-lubricating system. Oil rings should not rub on housing. Check slanting base.
Loads	Check loads for changed conditions, bad adjustment, poor handling, control trouble.

Close adherence to these schedules is important in keeping the plant running well and in avoiding serious trouble

INSPECTION FREQUENCY — SEASONAL — UP TO TWO YEARS	
CHECK POINTS	**INSPECTION DETAILS**
Windings	Check insulation resistance. Check insulation surfaces for dry cracks and other evidence of need for coatings on insulating material. Clean surfaces and ventilation passages thoroughly if inspection shows accumulation of dust. Check moisture, mold, or water standing in motors.
Air gap and bearings	Check air gap to make sure that the average reading is within 10 per cent, provided the reading should be less than 20 mils or 0.020 in. All bearings, ball, roller, and sleeve should be thoroughly checked, and defective ones replaced. Waste-packed and wick-oiled bearings should have waste or wicks renewed, if they have become glazed or filled with metal or dirt.
Rotors (squirrel-cage)	Check for broken or loose bars and evidence of local heating. If fan blades are not cast in place, check for loose blades. Look for marks on surface indicating foreign matter in air gap, or worn bearing.
Rotors (wound)	Clean around the collector rings, washers, and connections. Tighten connections if necessary. If rings are rough, spotted, or eccentric, refer to shop for refinishing. See that top sticks or wedges are tight. If any are loose, refer to service shop.
Armatures	Clean thoroughly all air passages if any are obstructed. Look for oil or grease creepage along shaft, checking back to bearing. Check commutator for surface condition, high bars, high mica, or eccentricity.
Mechanical parts	Check belt or chain for possible need of replacement. Do not wait for them to break during production rush. Clean inside and outside of frames and end bells. Turn rotor by hand to locate misalignment, sprung shaft, or rubbing. If motor is connected to a machine, check by turning both with lever, to see if the machine imposes an excessive friction load.
Loads	Read load on motor with instruments at no load, full load, or through cycle—as check on mechanical conditions of the driven machine.

Fig. 1. Inactive parts are being used again because of plant-wide solicitation

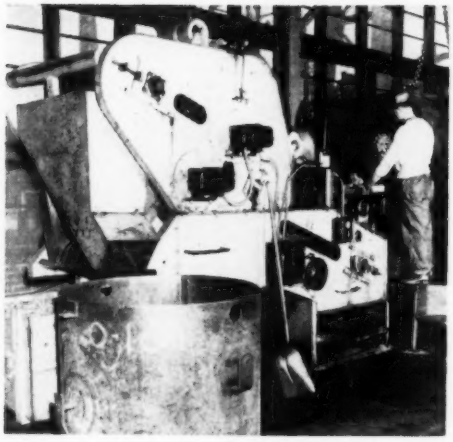


Fig. 2. Magnetic separator removes steel from babbitt before it is refined

Fig. 3. Refined babbitt being used again

PLANNED SALVAGE PAYS At Westinghouse Steam Division

By F. A. BULDRA, Supervisor of Salvage Steam Division, Westinghouse Electric Corp.

SCRAPPING materials before full utility is obtained is a practice that is being closely watched by improved salvage sections in many industries today. Now, more than ever, salvage departments are making big strides in planned reclamation.

Purpose of any salvage department should be to: (1) eliminate waste by analyzing all scrap materials; (2) utilize all short ends of material and by-products; and (3) dispose of all scrap that cannot be used. A few quick examples show the scope and results of an engineered reclamation program.

Going to the Source to Eliminate Waste: All scrap material coming into the salvage department for disposal is analyzed to determine if there is a possibility of eliminating waste. A simple example involved long bar ends that were considered waste from stock used in making turbine blades. The salvage operator did a little checking and learned that if the bars were cut in longer multiples, waste would be greatly reduced, and thousands of dollars a year would be saved.

Utilization of Short Ends and By-Products: Fabricating operations were scrapping as much as 4,000 tons of steel plate a year, until it was found that some of this material had further use. A flame cutting machine is now used to recut parts for jigs and fixtures, some production material, and also parts for other plants. Over three hundred tons of steel plate cut from short ends Fig. 5, saved a gross of $32,000 in one year.

Finding New Uses for Materials: Magnesia is used as heat insulation on the outer surfaces of turbine units, and scraps of these blocks previously were thrown aside as unusable material. Concurrently, an asbestos cement powder, mixed with water, was used to finish the outside of the turbine insulation. Looking for a way to make use of the

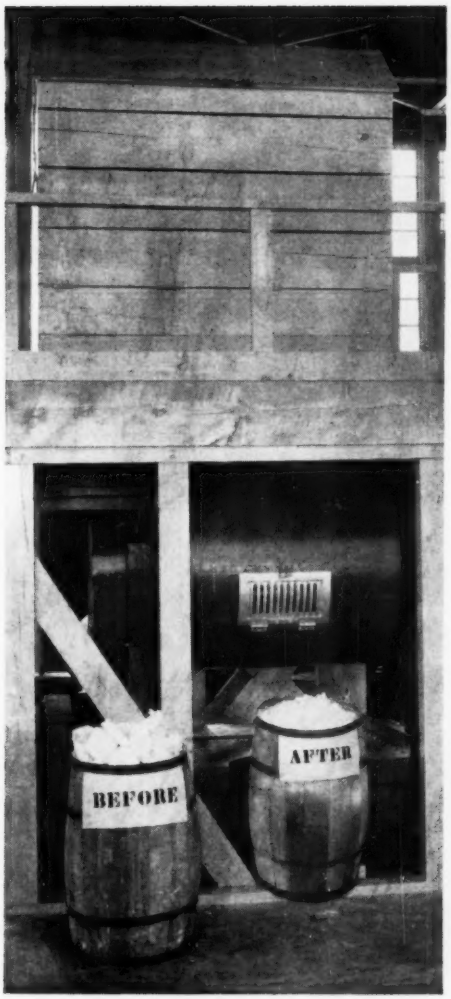


Fig. 4. Waste magnesia is ground here

Fig. 5. Here, 300 tons of short ends of steel plates were re-cut in one year to be re-used throughout the plant. Parts are cleaned, sorted, repaired and oiled

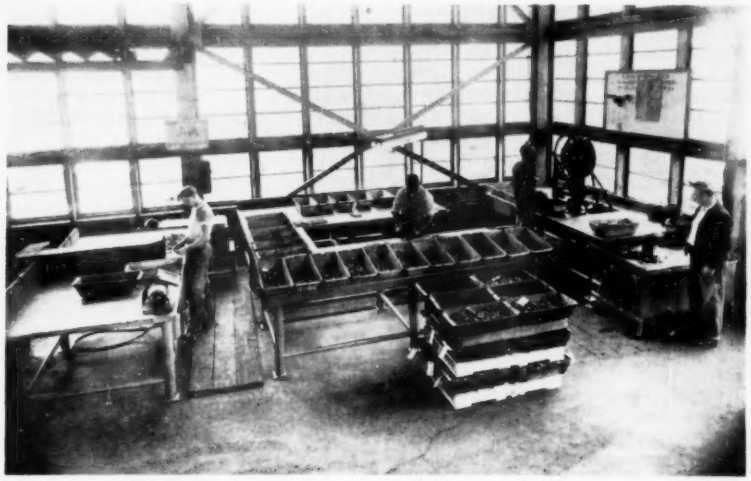


Fig. 6. 480,000 pieces of hardware, of $45,000 value, were reclaimed last year

scrapped magnesia, it was discovered that magnesia worked better in this application than the asbestos powder. This eliminated several hundred dollars worth of asbestos cement a year. It is processed as shown in Fig. 4.

Re-utilization of Inactive Parts: With a little care, inactive obsolete parts sent to the salvage department —such as pressure gages, thermometers, ball bearings, and valves —can be reclaimed for service. Semi-annual lists are sent to the engineering department, laboratories, test units, production groups, foremen, supervisors, and tool cribs. Because of the wide circulation of this information, as shown in Fig. 1, good results have been obtained. Numerous requests have been made for parts that might have been thrown away or sold at reduced values.

Reclamation of Babbitt: Each department in the shop is instructed to keep materials segregated so they will get back into channels where they will do the most good. Each year over one hundred tons of babbitt are refined and used again for bearings. The babbitt shop exercises care in keeping babbitt turnings free from contamination. Steel turnings are removed by a magnetic separator, Fig. 2, in the salvage department, and the babbitt is sent to a local smelter who refines it and returns it to the plant where it is processed as shown in Fig. 3.

Reclaiming Hardware: Discarded hardware is received from many assembly sections of the plant. It is material that has dropped to the floor or the bottom of pits during assembly and disassembly. Approximately 25 per cent of this hardware (nuts, bolts, studs, and washers) is thrown away because of damage to threads or other mutilation. The remainder is reclaimed.

Good parts are washed, wire brushed when needed, sorted and inspected for size, and oiled to prevent rusting. The material then goes back into a storeroom for reissue. The stores department issues an order to place these back into the storeroom again. Approximately 480,000 pieces of hardware per year, worth $45,000, are reclaimed in this manner. The area in which this job is done is shown in Fig. 6.

Salvage Department—A Small Business: The salvage department is run as anyone would run a small business. The department is charged for all incoming materials, and for overhead expenses including supervision, labor, and depreciation of equipment. The difference between cost and the selling price (to outside buyers or other departments in the plant) is the profit or gain for these operations. It is a measure of how successfully the department is being run, and also gives management information on what is being received for secondary materials. It gives the salvage operators an incentive in their work, for as products change materials change, and the department's problems are therefore continually changing from day to day.

SHORELINE MAINTENANCE

How to Keep Plant's Nose Above Water

While Los Angeles is looking for more water, this plant engineer in Long Beach is fighting a superabundance of the stuff . . . Like many of his counterparts in the vicinity however, he's winning the fight

TO C. H. CULBERTSON, plant engineer for Ford Motor Co.'s Long Beach (Calif.) assembly plant, "subsidence" is a nasty 10-letter word. Culbertson has had the unique experience of watching his plant's 75 acres literally sink underfoot. Between 1937 and Sept., 1953, the property sank 11.6 ft. Save for a network of dikes, Long Beach Harbor would have inundated the plant this year under some 3 ft of sea water at high tide. Currently the plant rests 1.7 ft below harbor water level during 5 ft 3 in. tides, and 3.7 ft below at the year's maximum 7.1 ft tide.

Moreover, Long Beach harbor's subsidence has a definite vortex of maximum sinkage—the center only about a mile from the Ford plant. At that point, engineers have computed annual sinkage as: November 1950 to November 1951, 2.37 ft; August 1951 to August 1952, 2.14 ft; August 1952 to August 1953, 1.696 ft.

It's Going Down!

Happily, this indicates a subsidence deceleration of approximately 0.285 per cent during the last year. At the Ford plant, readings showed a sinkage of 1 ft (plus) between Nov. 1951 nd Nov. 1952; a sinkage of but 0.89 ft. between Aug. '52-'53.

But engineers do not predict cessation until 1967.

Ford, however, is not alone. The entire harbor area, heavily industrialized, is waging heroic (and successful) battle against subsidence. In October, 1952, a $120,000,000 program was proposed to remedy further sinkage over the next 24 years. This envisages an expenditure of $5,000,000 annually, equivalent each year to about 1 per cent of the affected properties' $500,000,000 evaluation. At the same time, the Harbor's chief engineer, Robert R. Shoemaker, announced that three groups—industries, oil operators and public agencies—have already spent $40,000,000 in remedial work. Ford's outlay to date on three dike projects totals over $1,000,000.

From an engineering standpoint, subsidence first became noticeable back in 1937. Since then some harbor areas have sunk 17 ft. At stake is a multi-million dollar industrial hub—which includes, besides the big Ford plant, Procter & Gamble, a steam electric installation of the Southern California Edison Co., and many maritime and naval facilities.

But let's get back to Ford's Culbertson and his immediate problem: keeping production lines and their 1400 employees above water.

The Ford plant's anti-subsidence program is solidly based upon a dikage system. The plant is protected on two sides by dikes of its own—elsewhere by dikes of neighboring industries. It's a prime example of industrial cooperation, for all either sink or survive depending upon the dikage system's total efficiency.

One section of Ford dike is 1000 ft long, a pyramidal, earthen dike and clay-core cut-off wall, some 17 ft above mean low low tide. Hooking to this, and skirting 900 ft of Ford dockage, is a sheet steel piling dike, topped with a concrete cap, now 10 ft 8 in. above mean low low tide. This dike will be raised this year to 16 ft—enough to compensate for estimated maximum subsidence. A freeboard of 3 to 4 ft above highest tide is considered sufficient margin, enough height for occasional tidal surges, the result of oceanic disturbances. Another 250 ft earthen dike has recently been bolstered by steel piling, and raised to 16 ft elevation.

The 900 ft of additional piling involved in the newest, now-abuilding $300,000 project at Ford, will see piling driven tight against the existing dike's sea-facing wall. Both steel walls will be tied together by continuous welding and reinforcing bars, and the pilings' voids filled with concrete.

Thus, two types of dikage have been tried (1) sheet steel pilings; (2) clay-core cut-off wall, backed by earthfills and protected seaward by rock rip-rap.

Of the two, the clay-core wall is less expensive, but it requires more space. Typically, the 1000 ft long dike is 30 to 40 ft wide at its base, 25 to 30 ft wide topside. Thus it commandeers at least 40,000 sq ft of property.

Fig. 1. Plant Engineer C. H. Culbertson, inspecting sheet piling, sometimes feels like Hans Brinker at the dikes

Culbertson and his staff favor steel sheet piling in areas where the expenditure of so much land is not feasible. The existing pile wall is made of Z-type piles, most of them 60 ft long, and driven 30 to 40 ft below mean low low tide. The new facing will consist of 642 interlocking DP-2 piles, varying in length from 40 to 70 ft, altho the majority are 70 footers.

The 1000-ft earth fill and clay-core cut-off wall is also interesting.

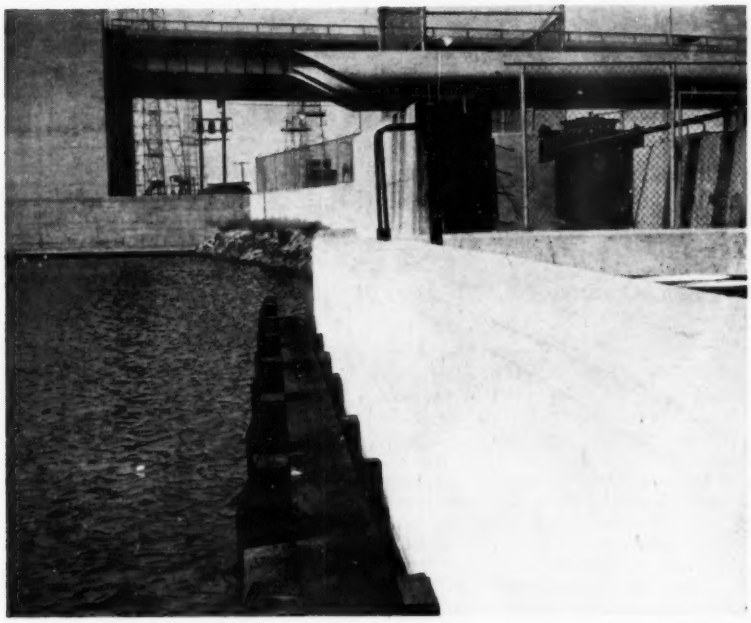


Fig. 2. **This wall of wood piling, concrete capped, will shortly be raised to 16 ft using sheet steel piling. Note large discharge pipes for removal of storm water**

It consists of a pyramidal dike, 30 to 40 ft wide at its base and 25 to 30 ft wide at the top, depending on its height. A 4-ft-wide trench is ditched by a special machine through the center of this dike to the subterranean cap level and back-filled with special oil well water-proof clay. The outboard or seaward side of the dike is faced with heavy rock.

Not only has the plant and its grounds sunk 11.6 ft, but there has been a 3-ft horizontal movement—in the direction of the subsidence vortex. However, there's been no major structural damage to plant buildings or facilities, because the buildings—set on piles— have sunk at the same rate as the land.

However, whereas originally storm water flowed into the harbor by gravity, it must now be collected in sumps and pumped out. The reason is obvious. The plant is below tide level.

A pump house is installed with three, 7500 gpm centrifugal pumps. All are Peerless models, driven by 75 hp, 1175 rpm electric motors. One of these pumps is also hooked to a Ford V-8 engine and is used as standby in event of electrical power failure. This third pump can also be manually operated in case of emergency. Right now, all three pumps operate intermittently, automatically started and stopped by switches adjustable to depth.

As previously mentioned, between Nov. 1951 and Nov. 1952, Ford property sank 1 ft (plus); yet between August 1952 and August, last year, subsidence rate was but 0.89 ft.

Sinkage Rate Map

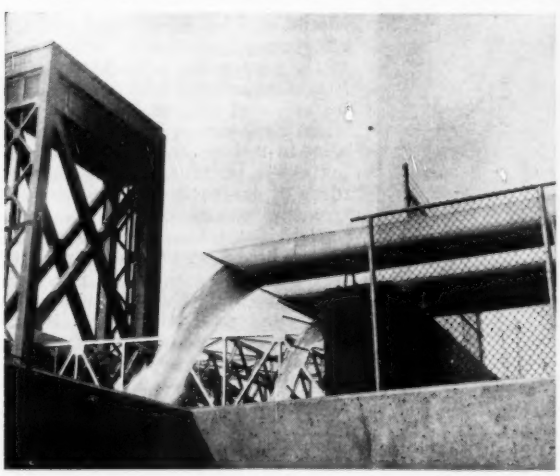
In anticipating subsidence and thus dike levels, plant engineer Culbertson has before him an estimated sinkage rate map compiled by the Long Beach Harbor Department. The map shows by segments just how much subsidence has taken place and the expected maximum sinkage, starting at the most heavily affected center. The Ford plant falls within the boundaries which indicate the one-year sinkage rate from Aug. 1951 to 1952, was an approximate 1.4 to 1.6 ft; that total subsidence to Aug. 1952 was 10 to 12 ft, and that expected maximum sinkage (by say 1967) will be 14 to 16 ft. This compares to the faster sinking vortex whose ultimate subsidence is estimated at 22 ft; sinkage to date is at 17 ft; from Aug. '51 to Aug. '52, there was a drop of 2.2 ft.

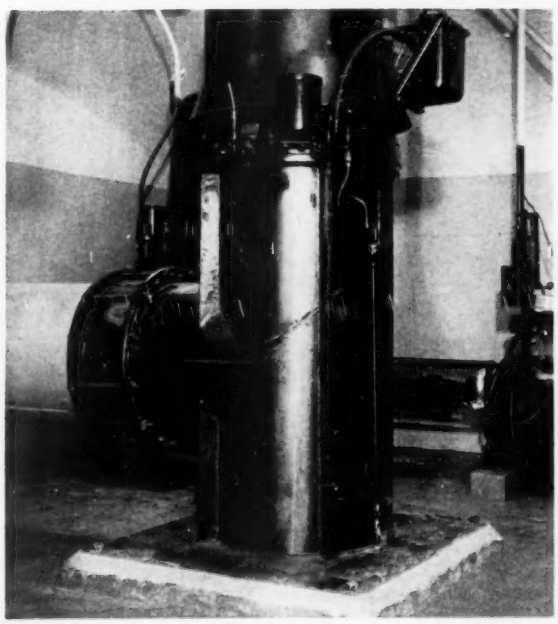
Monthly, Culbertson and other plant engineers of nearby factories, together with representatives of the Long Beach and Los Angeles Harbor Departments meet as a committee and walk the miles of dikes. Findings of these meetings are recorded in the form of minutes of the meetings, by the chairman.

"I've tackled plenty of problems," admits Culbertson, "but I never considered that one day I'd have to keep a plant above water."

Fig. 3, Below: Originally storm water flowed into the harbor by gravity. Now it must be pumped out of the plant property back into the harbor. Plant is below sea level

Fig. 4, Right: One of the special pumps needed to remove the storm water. There are three of these units with 7500 gpm capacity each driven by 75 hp, 1175 rpm motors





Plant Layout Method Does the Job at Reduced Cost

Here is an article on a simple plant layout method which has been used successfully by the writer . . . Procedure is covered step by step . . . Process flow chart is considered

By H. W. FARRINGTON, Plant Engineer, Croname Inc., Chicago, Ill.

MANUFACTURING efficiency in its highest sense can only be reached in a plant when due consideration is given to plant layout. This is done by a large number of organizations but there are some that may feel that plant layout is a cumbersome and costly process. For this reason, a simplified method is offered here—one that can be easily taught and easily learned. Its cost is within reach of small plants.

The following items are to be covered: Present plant layout; asset numbers; new floor plan; process flow charts; templates; new layout; approval; execution.

The following equipment comprises the minimum number of items for a layout job: graph paper with ⅛ in. square blocks; 100 ft steel tape; 6 ft rule; pencil; crayon. The assistance of one or preferably two men to go out into the plant to measure areas and equipment is advised.

On the cross ruled graph paper draw in, to scale, all permanent walls, and showing also, doors, windows and other openings, obstructions or deviations of elevation. By using four of these squares to represent a square foot you can show dimensions as small as 3 in. It is best, however, to show dimensions in writing also.

Next, consider a shadow graph of the machinery. This amounts to the shape of the machine that would be projected on a surface below if a light was used directly over the machine. This is the scale sized template you are now to block on your graph. Do not be too specific about curves and contours other than where machines are grouped or nested, such as with turret lathes, mills, etc. Curves and contours may improve the appearance of a layout but do not increase its efficiency. Draw templates in outline. Then, assign a number to the template; next, show the name and type of machine and also show the asset or group number. If the template size is too small, write the necessary information at the side. Show the distance of the center line and front line of the machine from some good reference point such as a column or wall center line. A marker should also be assigned to the side of the machine where the operator works. I generally try to use the asset number for this or a triangular symbol.

Draw in, to scale, all present walls or partitions that are not permanent. Outline department boundaries. It is also wise to note services such as air, water and gas. If the machine, benches and other equipment are not tagged with asset numbers, mark the same with yellow crayon in your own or an accepted code.

On the reverse side of your graph list all machinery and equipment by: template number, asset number, type or name of machine or equipment, horsepower of motors.

Fig. 1. Plant Engineer H. W. Farrington and Oscar Medhl, left to right, observe finished print of punch press department layout made by process discussed in text

Flow Chart

The next step is to lay out a tracing of the plant, preferably on cloth. Use either a checked architectural drawing for this purpose or your graph layout of the plant. Draw in all outside and permanent walls and openings. Also show any other permanent structure or service that should not be moved and yet will effect your floor plan. The best scale to choose for this is ¼ in. = 1 ft. It is also imperative that this drawing be as exact as possible because a slight deviation at ¼ in. scale means a lot in inches. Draw lines dark.

Have a positive Van Dyke print made of the tracing and mount same on some type of board so that it can be laid flat. Many use plywood or Upson board with horses for table.

It is essential that you know the products and the manufacturing processes involved in the layout. The easiest way to achieve this is by pictorial means and the simplest answer is the process flow chart. Get a large sheet of brown wrapping paper to start. You may find that several of these sheets are scrapped before the job is completed, because

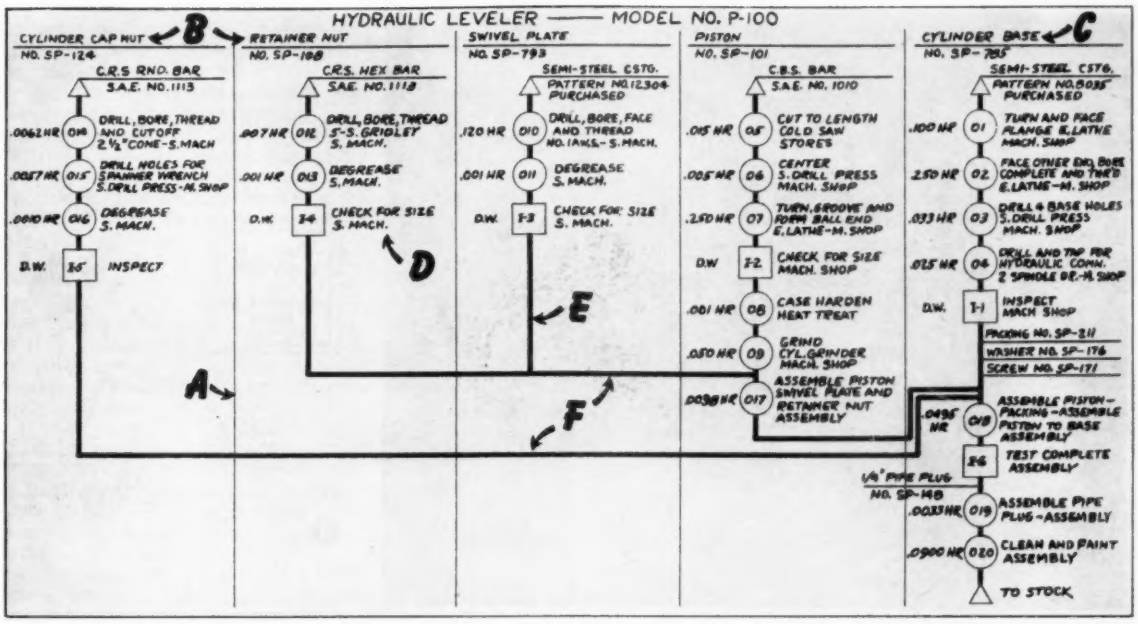

HYDRAULIC LEVELER —— MODEL NO. P-100
CYLINDER CAP NUT
NO. SP-124
C.R.S. RND. BAR
S.A.E. NO. 1113
RETAINER NUT
NO. SP-108
C.R.S. HEX BAR
S.A.E. NO. 1118
SWIVEL PLATE
NO. SP-793
SEMI-STEEL CSTG.
PATTERN NO. 12304 PURCHASED
PISTON
NO. SP-101
C.B.S. BAR
S.A.E. NO. 1010
CYLINDER BASE
NO. SP-795
SEMI-STEEL CSTG.
PATTERN NO. 8085 PURCHASED
B
C
D
E
F
A
.0062 HR 014 DRILL, BORE, THREAD AND CUTOFF 2 1/2" CONE - S. MACH
.0057 HR 015 DRILL HOLES FOR SPANNER WRENCH S. DRILL PRESS - M. SHOP
.0010 HR 016 DEGREASE S. MACH.
D.W. 3-5 INSPECT
.007 HR 012 DRILL, BORE, THREAD 5" - S. GRIDLET S. MACH.
.001 HR 013 DEGREASE S. MACH.
D.W. 1-4 CHECK FOR SIZE S. MACH.
.120 HR 010 DRILL, BORE, FACE AND THREAD NO. 1 NKL. - S. MACH.
.001 HR 011 DEGREASE S. MACH.
D.W. 1-3 CHECK FOR SIZE S. MACH.
.015 HR 05 CUT TO LENGTH COLD SAW STORES
.005 HR 06 CENTER S. DRILL PRESS MACH. SHOP
.250 HR 07 TURN, GROOVE AND FORM BALL END E. LATHE - M. SHOP
D.W. 1-2 CHECK FOR SIZE MACH. SHOP
.001 HR 08 CASE HARDEN HEAT TREAT
.050 HR 09 GRIND CYL. GRINDER MACH. SHOP
.0098 HR 017 ASSEMBLE PISTON SWIVEL PLATE AND RETAINER NUT ASSEMBLY
.100 HR 01 TURN AND FACE FLANGE & LATHE MACH. SHOP
.250 HR 02 FACE OTHER END, BORE COMPLETE AND THD E. LATHE - M. SHOP
.033 HR 03 DRILL 4 BASE HOLES S. DRILL PRESS MACH. SHOP
.015 HR 04 DRILL AND TAP FOR HYDRAULIC CONN. 2 SPINDLE DR. - M. SHOP
D.W. 1-1 INSPECT MACH SHOP
PACKING NO. SP-211
WASHER NO. SP-176
SCREW NO. SP-171
.0496 HR 018 ASSEMBLE PISTON - PACKING - ASSEMBLE PISTON TO BASE ASSEMBLY
2-6 TEST COMPLETE ASSEMBLY
1/8" PIPE PLUG NO. SP-148
.0033 HR 019 ASSEMBLE PIPE PLUG - ASSEMBLY
.0900 HR 020 CLEAN AND PAINT ASSEMBLY
TO STOCK

Fig. 2. This process flow chart pertains to the manufacture of a hydraulic leveler. It helps trace operations through plant

of changes in planning. When the chart is finished, it can be redrawn on graph or process paper, if you wish. The chart shown in Fig. 2 is laid out as follows: Draw light vertical lines, on the paper, spaced about 2 in. apart, (A). Going from left to right at the top of the sheet, write in the name and number of each sub-assembly involved in the layout, (B). The column at the extreme right side of the chart should carry the name and assembly number of the final product, (C). Under both the final product and sub-assembly headings, list the necessary operations in sequence, (D).

To the left of the operations sequence lists, draw vertical lines, (E). Horizontal lines should join the sub-assembly and final assembly vertical lines in the normal order of operations, (F). It may be pointed out that some sub-assemblies are combined and are represented by a single horizontal line joining the final assembly vertical line.

By charting all products manufactured you have an actual picture of the way production should flow.

At this time, it is necessary to make your individual movable templates for machinery and equipment you propose to use. Three dimensional templates are nice but many are costly. It is suggested that you obtain some colored 120 lb cardboard, preferably smooth surfaced, and use a different color for each type of machine or equipment, such as using blue for liquid tanks and yellow for benches. White is usually held for new equipment. Be sure to allow for the full size of the equipment and cut templates to the scale of your floor plan drawing.

Your next step is to get a decision from management as to whether you are to use line production or functional flow in your layout.

When you know your flow pattern, you can then start layout on your Van Dyke floor plan. You may wish to start with the old layout and then rearrange the equipment.

Lay the templates in groups or lines according to your specified type of process. If your board and templates are both made to the proper scale you should be able to space the templates within less than three inches. Particular attention should be paid to work spaces and storage spaces. The process flow charts will show you the need of storage spaces you did not dream of. Above all, be sure machines and equipment are accessible to the operator. Also be sure the maintenance man has room to service the machine. The space problem will also be a question where trucks or tote boxes are used.

Changes and Approval

The main principle to follow in setting your templates is to endeavor to keep the manufacturing flow in a straight line through the plant without back tracking. If a straight run is not possible use the "U" or "S" shape line of product flow. Study will show that you can even set up a job shop in this manner. Use your most frequent process as a guide. Overlay this with the less frequent processes and locate machinery and equipment accordingly. Equipment not used on any one process can easily be by-passed. One method in a job shop set-up is to locate equipment across the aisle from each other and move processes to and from equipment as needed. This will call for less back tracking. Feed assembly lines from the sides with sub assemblies or parts wherever possible.

When you believe that you have the templates laid out to your best ability, paste them down with rubber cement. This cement sticks easily, dries fast and yet templates and paste can be easily removed at will. Call in the foremen and let them tear your layout apart with their ideas.

When the foremen have made their amendments call in the supervisors. There are apt to be fewer changes in this phase of approval. Try if possible to get each one to initial the Van Dyke.

When you have received the required approval, check your layout to be sure all templates are pasted down securely. Make a legend or catalogue of all machines and equipment by template number, asset number, name, and horsepower. Mark the template number and horsepower beside each machine or piece of equipment. Then have several blue line prints made of the layout—one for each trade required to make the changes and one for each department that needs it. Be sure to keep at least one of each print for your files.

Prints can readily be marked for each trade showing electrical, air, water or sewer services. Next, make out a schedule of each and every move. Note that services have to be installed before a move can be really started. Check each department involved to ascertain how long they will be out of manufacture if you move them at certain dates. Try and plan your moves so that they cause the least interruption in manufacturing operations.

Both sleeve bearings and ball bearings have applications in electric motors. Pictured here is a typical application of a ball bearing equipped electric motor

BEARING MAINTENANCE for Industrial Electric Motors

This second of two parts on motor bearing maintenance describes points to be checked in case of bearing trouble, how end play and alignment are important, what over greasing and under greasing may result in, replacement of failed bearings, and test running of repaired machine

By J. W. **SAMZELIUS**, Mechanical Engineering, Westinghouse Electric Corp.

SINCE THE BALL bearing works on different fundamental principles from the sleeve bearing, it is misleading to make comparisons of the two bearings or to make deductions in regard to the behavior of one bearing based on experience with the other. The only comparison that can be made is in regard to the service either bearing will render over a period of years.

The ball bearing assembly is a self-contained unit made to close limits with a high degree of surface finish. It is, therefore, rather sensitive to abuse in handling and to dirt and corrosive conditions. For these reasons, the housings must be designed to exclude entry of dirt as well as possible, but careful handling of the bearing during installation and protection from dirt during relubrication is even more important for trouble-free operation.

Grease, which supplies the lubrication for most ball bearings in electric motor applications, is in itself the best guardian against corrosion and dirt. Therefore, the right quality and proper quantity of grease in and around the bearing is of the greatest importance for best performance.

Part 2.—Ball Bearings with Grease Lubrication

TO ELIMINATE THE HAZARD of improper greasing, the ball bearing manufacturers have spent great efforts to develop pre-lubricated and sealed bearings that are truly self-contained bearings. These are well protected from exterior dirt, and are never subjected to the hazard of unsuitable or contaminated grease being introduced during operation. (See Figs. 1 and 2.)

Points to be checked in case of trouble:

1. **Rotor End Play:** Standard motors are often designed so that each bearing floats axially by a small amount, Fig. 3. Thus, the rotor is free to move axially if sufficient force is applied on the shaft extension. Due to close fits between the bearing and its housing, considerable force may have to be exerted to move the rotor axially. Heavy blows must be avoided in checking the endplay since this may ruin the bearings and also would indicate that the shaft may not have necessary freedom for expansion.

Many designs are made with a locked bearing at one end so the rotor as a whole cannot move. The shaft, however, still must have freedom to expand, so the opposing bearing must float, Fig. 4. To ascertain that such is the case, the locked bearing might be freed temporarily by loosening the bolts that clamp the bearing by an inner cap. These bolts, usually three or four, are located around the housing on a circle slightly larger than the bearing. The bolts should be loosened

not more than two turns, after which tapping on the boltheads will free the bearing so that the check for endplay can be made similarly as prescribed for the floating rotor.

If the rotor does not have the desired freedom (approximately 1/32 to 1/16 in.), the reason for the deficiency must be found and proper correction be made before the motor is put in operation.

2. How to find the reason for lack of endplay: (a) If it is difficult to remove the brackets from the bearings, it can be assumed that the original housing bore was too small or possibly out of round, or that corrosion and rust have caused the bearing to bind.

It may be also assumed that any of these conditions will cause the bearing to become tighter during running since the bearing is generating heat that may cause the bearing to expand faster than the housing.

If the bearing does not show discoloration from heat and appears free in turning—not loose and sloppy—it may be undamaged and serviceable. (Discolored spots or bands around the outer race are probable signs of fretting corrosion caused by vibratory motion between bearing and housing and are not the result of heat.) The bracket bore should then be relieved by scraping or polishing with emery cloth until the bracket slides over the bearing without binding.

If the bearings are the pre-lubricated type, the machine may now be assembled for a trial run, and if earlier symptoms of trouble (heat or noise) have disappeared, the motor may be put back in operation.

If the bearings are of the type to which grease must be added periodically, the first step should be to clean out the old grease with clean kerosene and a clean paint brush. After making sure that all dirt is removed from the interior, the bearing is regreased and the motor assembled for a trial run, same as with the pre-lubricated bearing.

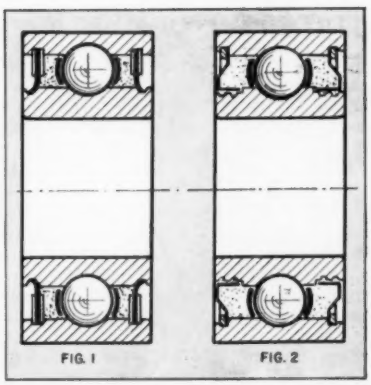
(b) If the brackets come off the bearings easily, although the original check indicated that the endplay was insufficient, the trouble may rest with faulty machining of the shaft, the brackets or the frame.

The most serious type of thrust loading appears if the bearings in the completed motor assembly are tight against the shoulders in both bearing housings. This will produce very high thrust loading against positive stops as soon as the shaft starts to expand. Both bearings may then suffer severe damage. Such extreme conditions of insufficient endplay are rarely found in practice since routine testing would reveal the error at once.

If the shoulders that locate the bearings on the shaft or the shoulders in the housings that limit the play are made with too large fillets, the bearings may locate against such fillets rather than against shoulders and a similar condition as mentioned may be approached. A visual inspection of the shoulders should reveal whether or not a lack of endplay is due to faulty shoulders or fillets.

Checking Alignment

If the bore of the bracket is not true with the face of the rim, or if the frame is not machined to make the ends parallel, the bearings will be misaligned and probably bind in the housings. This type of misalignment does not become acute until the brackets are bolted tight against the frame and is therefore difficult to detect. Any misalignment between the bearings tend to lock the bearings in the bracket bore and therefore the check of axial freedom (endplay) is a valuable aid in establishing errors in the machining of brackets and frame.



Figs. 1 and 2. Two examples of prelubricated and sealed motor bearings

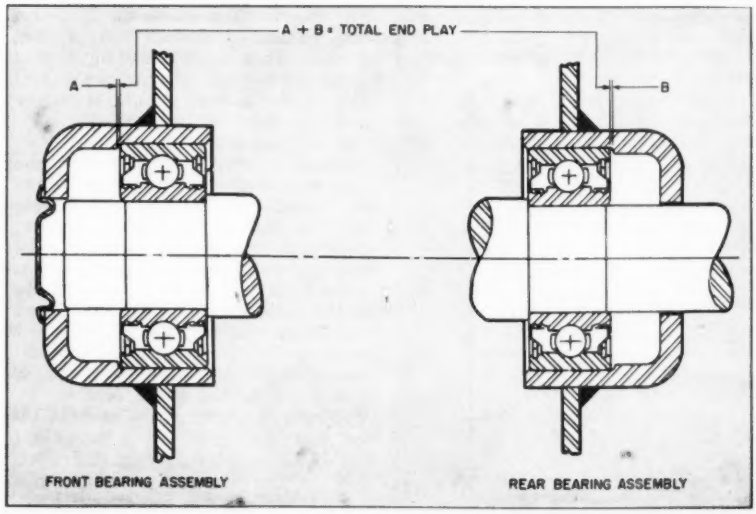
Misalignment caused by mounting bearings in a cocked position on the shaft, or misalignment due to a bent shaft can be checked accurately if the rotor is supported in vee blocks under each bearing. Indicator readings against the side of the inner race will show if the bearings are cocked and indicator readings against the shaft or the rotor will show if the shaft is bent.

All forms of misalignment are detrimental to good performance and must be eliminated as completely as possible. If the misalignment is excessive it will definitely cause extra loading on the bearings which may result in bearing failures. If it is mild it may be responsible for excessive retainer wear. This is a typical characteristic of a bearing that is cocked on the shaft, and of a bearing that is forced out of line by a faulty bracket. Misalignment due to a bent shaft will probably be most noticeable by excessive vibration during running.

3. If Endplay and Alignment are Right—Look for Other Reasons: There are many reasons for bearing trouble, but some of these are complex in nature and require laboratory examination of the bearings. In such cases it is important that the troublesome bearing be taken off the shaft without causing further damage that might make later inspection difficult. In dismantling any bearing that is expected to be reinstalled for further service or to be sent back for examination, the bearing should, if possible, be pulled off the shaft by the use of a puller engaging the back side of the inner race. If the bearing is for examination only, it may be pulled by the outer race provided it is not rotated while being pulled.

Since overgreasing, lack of grease, unsuitable greases and dirt introduced in the bearing with the grease are factors causing trouble, it is important to differentiate between ball bearings where these factors may have existed and prelubricated and sealed bearings where these hazards are practically eliminated.

Fig. 3. **Standard motors are often designed so that each bearing floats axially by a small amount thereby allowing the rotor of motor to also move axially**



(a) If a bearing has failed from overgreasing, the failure is usually due to heat. Therefore, it may be expected that such a bearing will show discoloration from heat and will contain burned and carbonized grease. One may also find an over-supply of grease in the cavities of the housing.

Overgreasing is not an uncommon reason for bearing trouble. In the electric motor an over-supply of grease may also damage the insulation if the grease leaks into the motor.

(b) Lack of grease will also cause the bearing to run hot and show blue discoloration from heat. In such cases a black and dry powder of carbonized grease will probably also be found in the bearing but very little grease is expected to be found around the bearing. A bearing lacking grease will probably also be noisy in running and will suffer damage very quickly.

(c) Dirt and foreign particles in the bearing may cause damage and bearing failure, but the extent of the damage cannot ordinarily be told until the bearing is taken apart. Such a bearing will usually feel rough in turning and may be very noisy in running.

(d) Bearing failures from overload not due to misalignment or lack of endplay are very rare since the safety factors applied in calculating belt drives or overhung loads are liberal enough to allow common abuse.

Misalignment a Factor

In coupled m-g sets, the bearing loads and capacity are such as to give an extremely long calculated life if only the normal load is considered. Here, however, misalignment with other machines is a factor which may overload the bearings. This should be borne in mind in case of failure, and if misalignment is found to exist, it must be corrected in connection with the bearing replacement.

(e) If the operating conditions for the bearings are severe, the bearing life will be shorter than if the conditions are more favorable. This is an accepted fact among experienced bearing men and the maintenance men can do much toward promoting a broader understanding of this simple fact among his customers.

Severe conditions are created by high speed, continuous service, and high ambient temperature. Dirty surroundings, especially if the dirt is fine and abrasive, high humidity caused by steam, and water and acid fumes in the atmosphere tend to destroy the lubricant and thereby reduce the life of the bearing.

4. Replacement of Failed Bearings: When a bearing has failed, or there is doubt about its condition, it must be replaced by a new one. It is important that the replacement bearing be of the same type as the original. It is also important to correct any errors in the parts or in the mounting which may have caused or contributed to the failure of the old bearing. Since the time permitted for such checking might be limited, it is important that the service man knows how to perform the checks in a rational way. A step-by-step procedure should be followed that is similar to the procedure outlined in this article.

Responsible service men will also be careful not to permit any new errors in the mounting, therefore a step-by-step checking of all important points should also be followed in the replacement operations.

After the assembly is complete, free turning of the rotor and unrestricted endplay are the best indications of a proper assembly.

5. Test Running of the Repaired Machine: To be reasonably sure that the repaired machine is satisfactory it is well to watch its operation under load for sufficient time to see that it performs all right. During this time the temperature of the housings, the noise emitted by the bearings, and the vibration, should be watched closely for signs which may indicate future trouble.

The temperature will, of course, rise slowly for considerable time as a normal occurrence. If however, one bearing increases its temperature more rapidly than the other, it should be viewed with suspicion, and especially so if this bearing is not carrying the external load. In single and ventilated motors the bearing at the exhaust end is usually hotter than the bearing at the intake end due to the hot air from the motor passing over the housing.

If the opposite should be found, there is reason to believe that the cold intake air is cooling the housing so effectively that the housing may expand less than the bearing and thus the bearing itself may become too tight. Such a condition is perhaps unusual but is possible and should therefore be mentioned since someone may try to cool a hot running ball bearing by artificial means and find that the bearing gets worse due to the same reason.

If both bearings seem to heat up too fast and give off a squealing noise, the endplay may be restricted due to the expansion which has

(Continued on page 172)

Fig. 4. When there is a locked bearing at one end the rotor cannot move. The shaft, however, must still be able to expand, so the opposing bearing must float

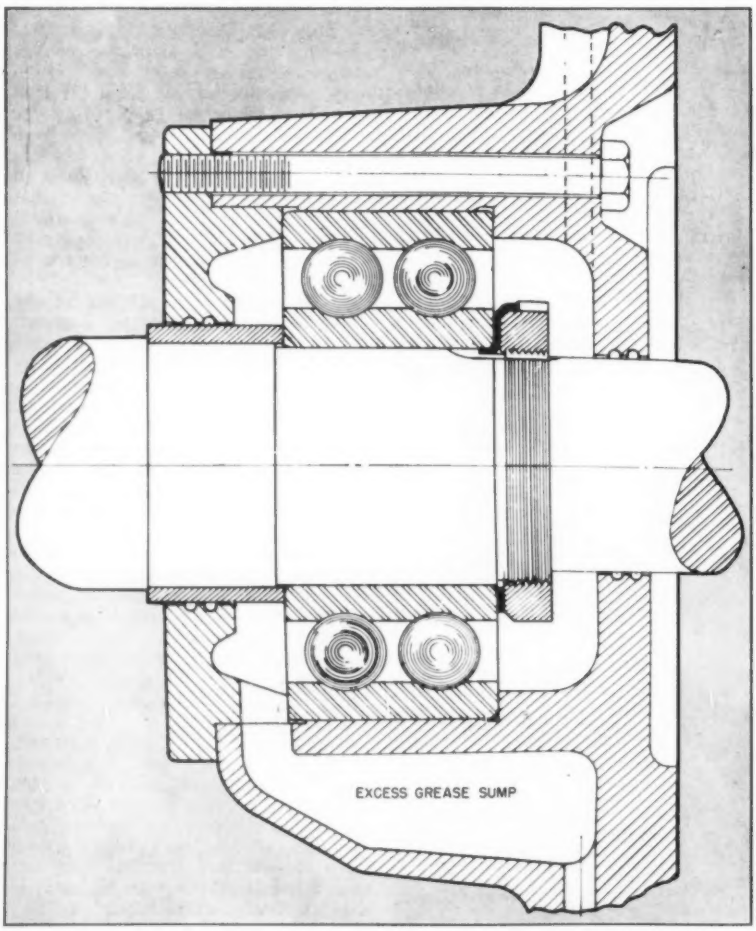


Fig. 1. Flame hardening of a gear for a drilling rig rotary is accomplished by this semi-automatic set-up. The heated tooth is moved by indexer to a water spray for quenching

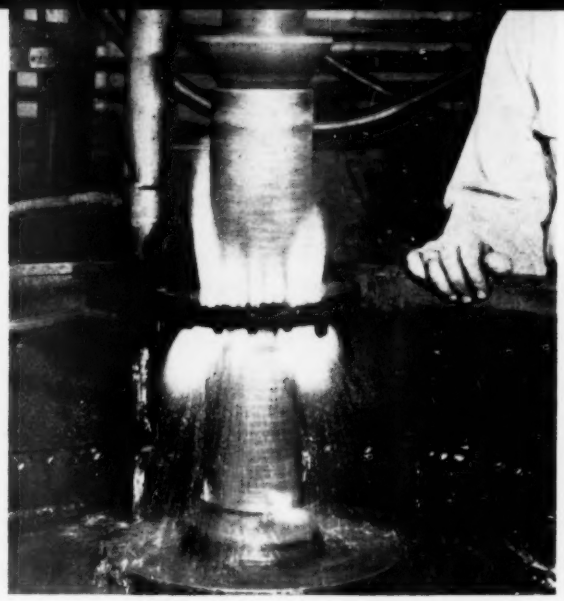


Fig. 2. A combination gas ring torch and water spray moves upward over rotating wash pipe and gives continuous hard surface of uniform depth on outside or inside diameter

Flame Hardening Gets an Assist From Plant Engineering Department

Most of National Supply Company's flame hardening methods and machines were pioneered by the Plant Engineering Department of the Torrance, California, plant

FACILITIES FOR heat treatment, including flame hardening, are the particular concern of the Metallurgical and Plant Engineering staffs of the National Supply Co. They are functionally responsible for machine design, installation and the techniques of application.

The problems of flame hardening at National are perhaps most acute because of the great variety of part sizes and shapes which receive this treatment. Because the company has relatively few of each part or assembly which require a flame hardening treatment, the Plant Engineering Department must meet prescribed standards of quality with adequately designed equipment, but without the burden of complication or of great variety. This has been accomplished over the twenty-odd years of continuous in-plant development.

These designs cover the application of flame hardening in its simpler form—that of a single tip manually operated jet—through a range of multiple tip jets, continuous ring or plate feed jets, automatic rotation controls, vertical and horizontal traversing torches, and mixing valve controls.

A large ring gear is cited as one example of a part requiring special flame and quench application. Each tooth on the ring gear, which is cut on a spiral bevel gear generator, is approximately 6 in. long. It is advisable to flame harden both sides of this tooth as a precaution against any possibility of distortion after precision machining. In order to obtain the extremely high quality required, it is further necessary to apply the surface heat over the full length of the tooth to maintain strict uniformity on all hardened surfaces. These prerequisites with automatic control of rotation and immediate quenching, complete the requirements for this particular machine.

Versatility of specialized flame hardening methods and machines that have been developed by plant engineers of the Torrance, California, plant permits more extensive use of natural gas for this purpose.

Spot hardening is the simplest job for a torch. This requires heating only the area to be hardened, using a hand torch, and following with direct quenching in an oil or water bath. Only areas that are not dimensionally critical can be treated in this way, since no controlling mechanism can be used and the operator depends on visual estimation of both temperature and depth of heat. Parts that are commonly flame hardened in this way include sprockets for drive groups and drawworks. These parts have relatively large teeth, move in only one direction, and therefore need to be hardened on one face of the teeth only.

Stationary ring torches consisting of two or more gas burners are used in hardening other parts while they are rotated at a predetermined speed. After reaching the desired temperature parts are submerged in a quenching bath.

A third method of flame hardening is by progressively moving the torch over the area to be hardened and following with a water spray quench, Fig. 1. Many of the torches are made with a separate manifold for the water spray so that, as a segment of a surface to be hardened is heated to the desired temperature, the torch moves along the work and the spray contacts the heated area immediately afterward.

Large ring gears and pinions, which drive the rotary table of the drilling rig, and many smaller gears are hardened by this method. Large sheaves for crown and traveling blocks are hardened similarly although the sheaves are rotated slowly and the gas torch remains stationary.

A ring torch with a water spray attachment, Fig. 2, is used on some cylindrical parts while the part is rotated and the torch is moved from the bottom to the top of the surface being hardened. This method gives a continuous hard surface of uniform depth on either outside or inside diameters. The wash pipe used in swivels that support strings of drill pipe in the derrick is a typical example of a part hardened in this manner.

Application of HELICAL GEAR PUMPS

Description of operating principle . . . Advantages and disadvantages . . . Application in chemical plants, food handling, ceramics, paper mills, automotive manufacturing, pharmaceutical and other fields . . . Materials of construction . . . Operation and maintenance . . . Use with corrosive and viscous liquids . . . Causes of breakage

By G. H. ZIMMER, Chief Engineer, Moyno Pump Division, Robbins & Myers, Inc.

IN THE YEARS immediately following World War I, a French engineer, René Moineau, was working on the problem of developing a supercharger for the French Air Force. His efforts produced no new principles in aerodynamics but out of his precise mathematical mind came a new principle in the pumping of liquids. The Moineau pumping principle can most easily be explained by a few illustrations. First examine Fig. 1, showing the rotating element (rotor). This part is a single threaded element of which any cross-section perpendicular to the axis forms a perfect circle. The center of these circles, however, is displaced from the center of the whole part. Figure 2 shows an end view of this rotating part and the relationship between the center of a section relative to the center of the part.

Before proceeding farther into the rotor description let's examine the stationary element. This part is a double threaded part, whose "lead" is twice the "lead" of the rotor. Figure 3 shows the stator while Fig. 4 shows an end view of this part. It will be noted that the surface of the stationary element is composed of two semi-circles connected by a rectangle. The diameter of this formed circle is equal to the diameter of a circle formed at any perpendicular section to the longitudinal axis of the rotor (Fig. 1).

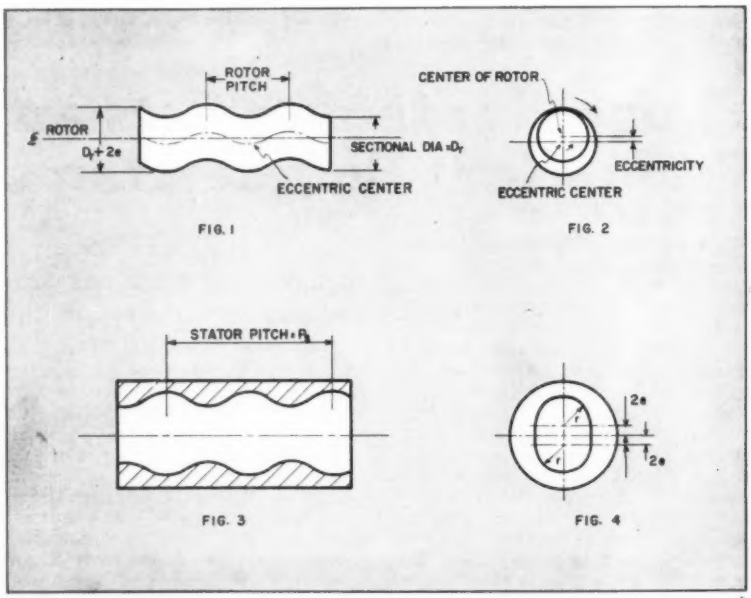


Fig. 1. Rotating element of the pump. Fig. 2. End view of the rotating part. Fig. 3. Stationary element of the pump, or stator. Fig. 4. End view of the stator

The Stator

A simple description of the formation of these parts can best be given as follows:

Picture a flat forming tool made of two half circles at the ends of a rectangular section, as shown in Fig. 5. If this tool were heated and forced through a block of ice, being rotated uniformly as it melts a path, it would generate a double internal helical opening, as shown in Fig. 6. This block of ice is analogous to the stator or fixed element.

Now consider another forming tool consisting of a simple disc of diameter "D" mounted eccentrically on a shaft as shown in Fig. 7. If this tool were heated and forced into another block of ice while being rotated uniformly about the shaft centerline, a surface similar to a rotor surface would be found (Fig. 8).

A careful study of the end view of the rotating element, Fig. 2, reveals that the eccentric center of the rotor revolves about the exact center of the rotor but in a direction opposite to the direction of the surface of the rotating element. This feature requires the use of a free floating drive which will transmit torque yet allow the eccentric center to revolve about the true rotor center in a direction opposite from the rotor surface.

Let's assume now that the rotor, Fig. 1, is inserted in the stator, Fig. 3. The rotor now fills in that area of the stator formed by the two semi-circles and leaves unfilled the area equivalent to the shaded rectangular space, Fig. 9. It is this space that makes up the void which carries the liquid. This void is expressed in area as $4ED_r$ where E represents the eccentricity and D_r represents the diameter of a rotor section. The volume of this void then becomes $4ED_rP_s$ where P_s is the length of the stator thread.

While brief, the above description attempts to present the principle of the helical gear pump. From a study of the above, the following conclusions can be drawn:

(a) The displacement of this type pump is expressed as $4ED_rP_sN$ where N represents speed in rpm.

(b) The maximum path that any particle could travel can be expressed mathematically as

$$\sqrt{\pi^2 (4E + D_r)^2 + P_s^2}$$

(c) Liquid velocity is expressed mathematically as

$$\frac{\sqrt{\pi^2 (4E + D_r)^2 + P_s^2} \text{ (Speed)}}{60}$$

(d) Two sealing lines are developed between the rotor and stator for every full pitch of stator contour.

(e) During each revolution the liquid carried in the voids between the rotor and stator progresses continuously toward one end of the stator giving this type pump a positive and uniform discharge.

(f) As any one liquid carrying cavity is sealed off another cavity is fully open and at intermediate points two cavities will be discharging liquid at the same time. It can be shown mathematically that the total displacement is constant.

(g) Axis of the rotor revolves about the axis of the stator with both axes being parallel yet displaced by a distance equal to the eccentricity.

(h) The spiral sealing contact is of a line type and projected resembles two "O" rings in series for each pitch of stator element. Therefore, several pitches of stator elements in series represents many "O" rings in series resulting in relatively high pressure performance.

(i) Velocity of the liquid entering the pump is the same as the discharge velocity. This feature limits the capacity to which these pumps can be built but at the same time is advantageous since minimum turbulence is encountered.

The advantages and disadvantages of this type of pumping principle are:

Advantages: (a) Self Priming; (b) Capable of high suction lift; (c) Positive displacement; (d) Metered uniform flow; (e) Low internal velocities; (f) Handles large particles in solution; (g) High efficiencies at low volume; (h) Reversible—Pumping equally well in either direction of rotation; (i) Capable of delivering relatively high pressures; (j) Handles highly viscuous materials with ease.

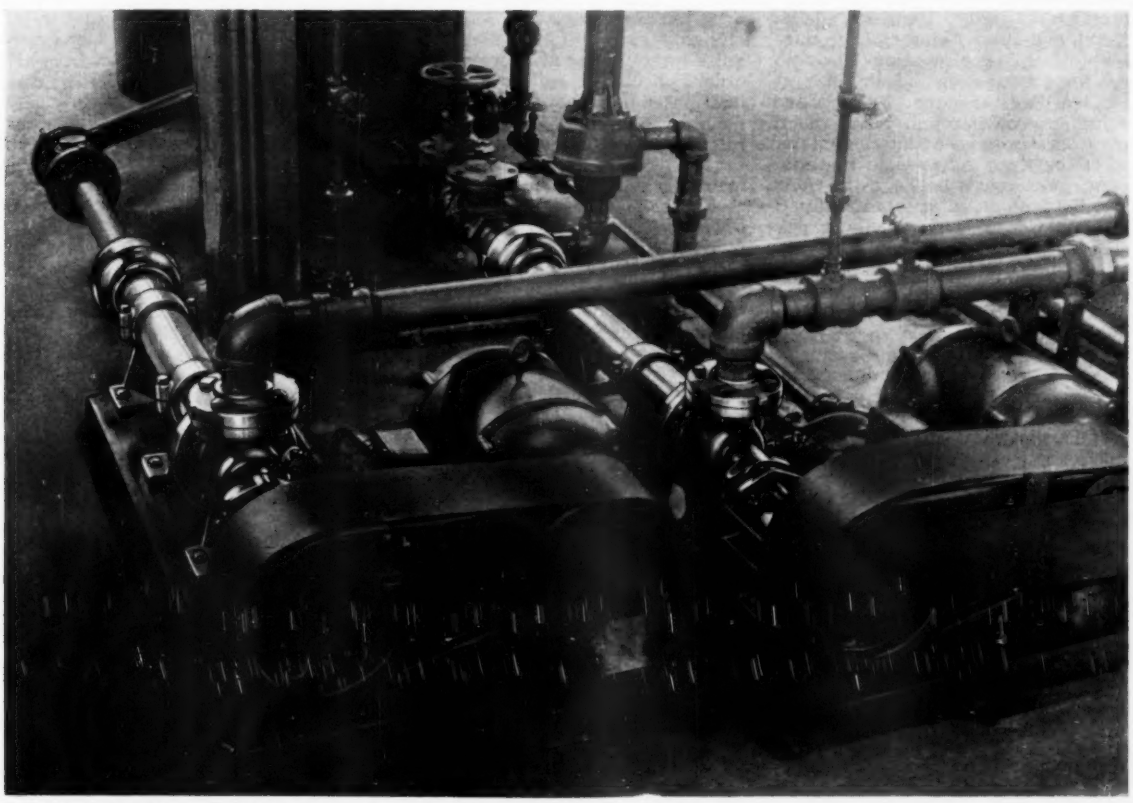
Disadvantages: (a) Limited to capacities below 500 gpm; (b) Requires flexible drive member, requiring compromise in design and limits on pressure ratings; (c) In general requires extreme accuracy in making of pumping elements resulting in comparatively higher cost; (d) Physical size of units embodied in this principle is much greater than certain other type pumps especially as compared to the centrifugal; (e) Eccentric motion of rotor (dynamic unbalance) limits speed of units.

This pumping principle has been successfully applied to the chemical industry, in food handling, ceramic fields, paper mills (paper coating), the building industry, automotive manufacturing, medicinal and pharmaceutical fields as well as for handling water, oils, paints, varnishes, cements, glues, etc. This type pump is used by virtually every major company in the world handling liquids varying in viscosity from liquefied gases to semi solids, at volumes of from less than 1 gpm to more than 200 gpm and at pressures from 0 psig to over 1000 psig.

Usually pumps of this type are engineered to fit specific applications with careful consideration being given to speeds, piping, viscosity, materials of construction, port opening sizes, etc. Before discussing applications in detail it will be well to consider the materials of construction. Since the pumping elements consist of the rotor and the stator, we will confine our discussion to these elements.

Rotor—The rotors are made of metal and are usually of two types: (a) Hi carbon, hi chrome, air hardening tool steel for maximum abrasion resistance; (b) Type 316 stainless steel for corrosion resistance. Through experience it has been found that the addition of heavy layers of hard chrome plating to the surface of both types of rotors increase the abrasion resistance of the parts.

Stators—Stators are made of molded rubber and molded synthetic



In this installation of helical gear pumps, clay slip is handled on a filter press application. Pumps operate at 650 rpm

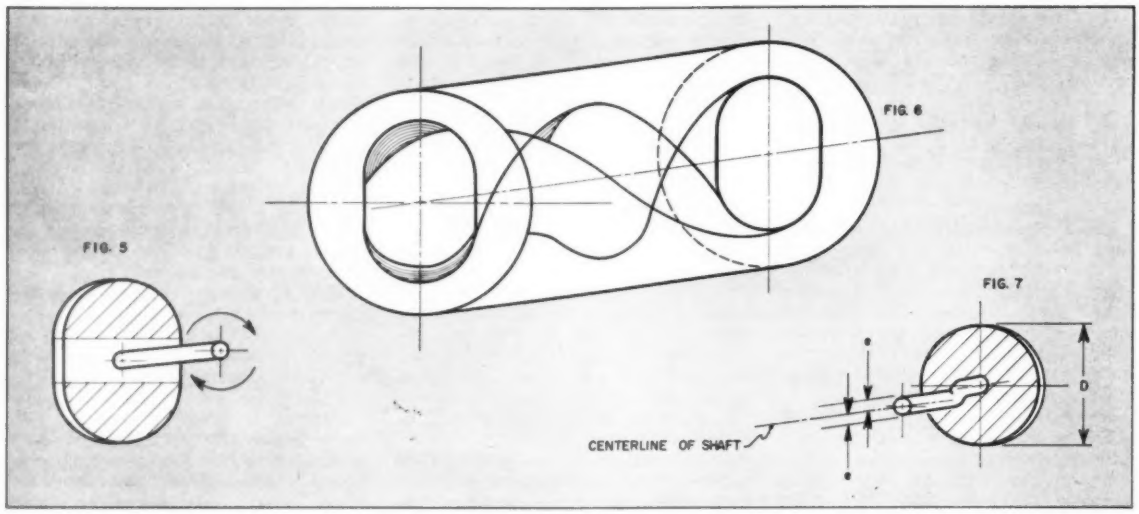


Fig. 5. This is the shape of a tool which might be used in forming a double helical opening for the stator which is shown in Fig. 6. Fig. 7. Tool for forming the rotor might look like this. See Fig. 8 for path of travel through block of ice

rubber, tool steel, stainless steel and bakelite. Molded rubber and synthetic rubber stators have the widest usage and are always used unless the liquid to be handled is detrimental either chemically or because of excessive temperature. When handling coarse abrasive material, a soft (947 Shore Durometer) natural rubber material is used, while on higher pressure less abrasive applications a harder (70 Shore Durometer) Buna N stock is used. A compression fit exists between metal rotors and rubber stators. The purpose of this compression fit is to reduce slippage of the liquid past the seal lines and, thereby, improve volumetric efficiencies. When metal rotors are used with stators made of metal or some other rigid material a clearance exists between the rotor and the stator and unless the liquid is of a viscous nature, slippage is excessive and volumetric efficiency tends to fall to low values.

Materials

Castings: Castings are usually made of cast iron, 316 stainless and mild steel.

Shafts and Flexible Rods: Standard construction materials are 316 stainless steel and alloyed carburizing steels.

As explained previously, the use of multiple-pitch-length rotors and stators create the effect of many "O" rings in series, therefore, higher discharge pressures are easily obtained by merely making the elements longer. The only limitations to length are those practical limitations imposed by machining and molding.

Correct application of this pump requires complete knowledge of the liquid to be handled and the operating conditions. Highly abrasive liquids require low speeds, soft natural rubber stators, high abrasion resistant rotors and sufficient multiples of pumping elements to reduce slippage to a minimum.

Temperatures in excess of 150F usually require that rotors be made undersize to allow for thermal expansion of the rubber stators. Temperatures in excess of 200 F can not be handled by rubber stators. Liquids which cause deterioration of natural rubber may require synthetic rubber stators or even metal or bakelite stators. If metal stators are required the viscosity becomes important.

Highly viscous liquids usually require large pumps at slow speeds in order to obtain sufficient size of inlet ports. Discharge pressures will dictate the number of multiples of rotor and stator pitches required. Corrosive liquids require special materials and construction. The correct selection of the proper pump based on accurate and complete application data will usually provide satisfactory operation of this type pump.

Service: Usually maintenance of all equipment falls into five classifications: (a) Rapid or excessive wear; (b) Breakage or failure of parts; (c) Noisy operation or excessive vibration; (d) Excessively low efficiency; (e) A combination of any and all of the above.

Wear: It is possible that in pumping some liquids, all of the above problems can be encountered and yet the application can be considered successful, when considered from the dollars and cents point of view. In other cases the source of trouble can be attributed to faulty installation or weaknesses in design.

One common complaint for this type of pump is short life of the pumping elements caused by wear. Consider, however, that the problem of wear is usually an expected problem and a user has already had considerable difficulty with other type pumps or similar equipment prior to the use of this type pump. Let's consider a normal application where the pump handles ceramic "Slip" consisting of ball clay, flint, feldspar, sand and water having a viscosity of approximately 50 to 100 cp. Excessive wear of the pumping elements (rotor and stator) can be lessened by reducing pump speed (lower internal velocity) and also by reducing slippage; in other words by increasing volumetric efficiency.

Reducing Slippage

How can slippage be decreased? Since slippage is a function of discharge pressure, it is most easily reduced by a corresponding reduction in discharge pressure. This can often be accomplished by increasing pipe sizes, reducing length of piping or reducing the amount of liquid being handled.

Too often pipe lines are laid out to handle 1200 gph but increased production schedules require 2400 gph or more through the same piping. The additional friction means higher pressures for the pump to develop. The use of multi-stage units having more seal lines in series also helps reduce slippage.

Some liquids having coarse solids in suspension (60 mesh or lower) require use of soft-pliable rubber in the stator. This material (permitting deflection of the rubber) allows the coarser solids to imbed in the rubber so that the metal rotor can easily pass over the abrasive particle without scoring the rotor. A general rule is—high abrasive liquids should be handled at minimum pressures and speeds with tool steel rotors, hardened to 57-60 Rockwell C and chrome plated to obtain a surface hardness of 70-74 Rockwell C and with soft rubber stators.

It is not uncommon when handling abrasive liquids to have excessive wear of the flexible driving

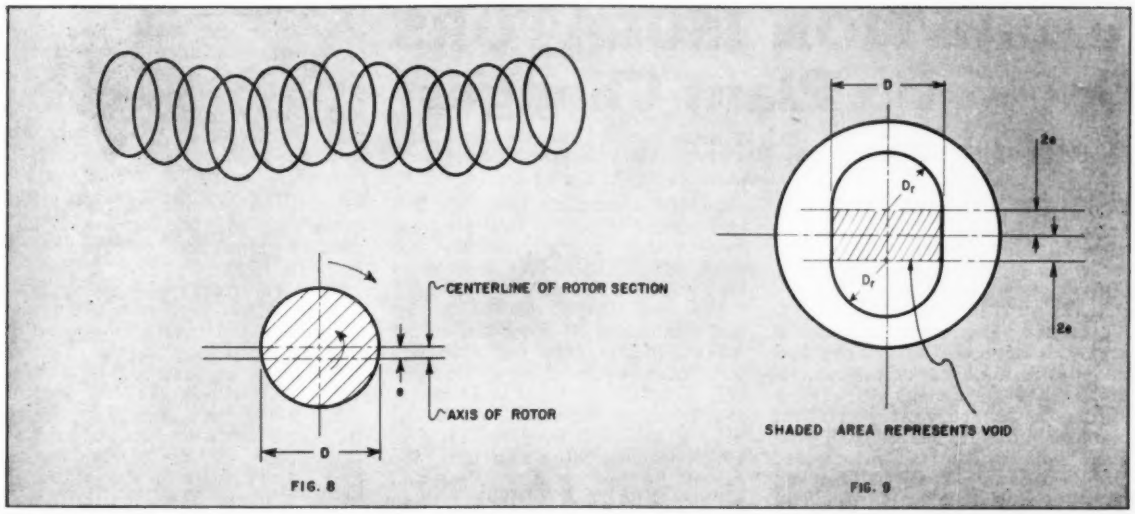


FIG. 8 FIG. 9

Fig. 8. If the tool shown in Fig. 7 were heated and forced through a block of ice while being rotated uniformly about shaft centerline, surface similar to this spiral would be formed. Fig. 9. Shaded area is equivalent to void that carries liquid

member (a universal type joint). The best method of extending the life of these parts is preventive maintenance (liberal applications of lubricating greases) plus periodic flush-outs of the pump and lines.

Since many liquids containing solids in suspension settle out during the shut down period it is not unusual for the pumps to be forced to start under the condition of handling, in effect, damp sand. The effect of this material will greatly affect the life of the parts. To prevent this condition piping can often be arranged to drain back into a sump or pump and piping can be flushed out after usage and before shut down. The most effective method of increasing life of the pumping elements when handling highly abrasive liquids is to operate at low speed and minimum discharge pressures.

Corrosion: Corrosive liquids normally are not troublesome if the correct materials of construction are used. If, however, abrasive particles are added to corrosive liquids then trouble is encountered, either from corrosion or abrasion. Most stainless steels depend on surface oxide films for their corrosion resistance. Abrasive liquids tend to remove this protective film and corrosive attack on the metal parts results. This type of problem can only be handled by changing to material which is not of the stainless steel family.

Handling Viscous Liquids

Viscous Liquids: The handling of viscous liquids occasionally creates problems. The more common complaint is low volumetric efficiency and excessive noise. Usually this is easily corrected by matching the liquid velocities within the pumping elements to those velocities (in the suction piping) which can be supported by the NPSH. For example, corn syrup having viscosities of 100,000 cp at 60 F might be handled at a certain speed yet when the temperature decreases to 32 F and the viscosity increases to say 200,000 cp a reduction in pumping speed will be required, otherwise cavitation will result with corresponding noise, vibration, low out-put and short life. In many cases large pumps are used in order to obtain inlet ports of sufficient size to allow the material to enter the pump suction.

Some installations cause difficulty when handling viscous liquids because of excessive pressures demanded to force the viscous liquids through the piping selected. Care must be exercised in determining the correct pipe sizes to prevent excessive overload.

Breakage: Breakage of parts is generally confined to the flexible driving shaft. This breakage is caused by many conditions, most common of which is "shock starting." Breakage also results from stress, corrosion, fatigue, over load conditions and in some cases because the starting torque demand is excessive.

Shock loading can be illustrated by one application where the pump is located in a vertical shaft mine 300 ft below surface. When the pump stops, the discharge line contains a column of solid liquid at rest. Since this type pump is of the positive displacement type, it will attempt to force the stationary liquid into motion instantaneously and high surge pressures will result. Air accumulators properly located will reduce this shock starting and eliminate breakage. Stress corrosion calls for material changes and in some cases design changes in order to eliminate breakage from this cause.

High starting torque demand of the pumping elements will cause breakage of the flexible drive shaft. This situation can be caused by the thermal expansion of the rubber stator when handling hot liquids. To overcome this condition, rotors are made undersized to prevent excessive compression fits after the thermal expansion has taken effect. Since the thermal expansion of rubber is approximately ten times that of steel the temperature of the liquid must be given consideration. A similar effect will result if the liquid tends to cause swelling of the rubber stators.

In recent years considerable progress has been made in adapting this pumping principle to inexpensive designs for special applications. A large appliance manufacturer has used over 400,000 pumps of a special design with remarkable success. Machine tool manufacturers are beginning to apply other special designs to lathes, grinders and special machines. Domestic water system pumps for use on shallow wells are produced in large quantities and other new applications are being sought and found continually.

VIBRATION ISOLATORS Speed Up Plant Changes

By HAROLD WRIGLEY, Plant Manager, Barry Corporation

JUST A COUPLE OF weeks ago we took the afternoon off, as far as production schedules were concerned, and converted the Barry Corporation plant into a large mechanical experimental laboratory. We invited some important visitors from the Defense Department, and the president of the Massachusetts Institute of Technology, to witness the test of a theory we had about plant mobility and flexibility of production lines. At the conclusion of our demonstration we had proved to everyone's satisfaction that by equipping machines with our special shock-isolating mountings, we could dismantle a complete assembly line and replace it with a new progression of eight heavy machines that were actually operating in 24 minutes.

This new type of machine mount had established its potentialities for making mobile units out of otherwise inert masses of heavy machinery. Shaped like large mushrooms, four of these were attached to the base of each test machine, some of which weighed over two tons. By raising the machine off the floor, and at the same time anchoring them firmly, these mounts practically eliminate vibration, and simultaneously do away with the old method of bolting and lagging heavy machinery to the floor or to a special concrete base.

As a control experiment we had a comparison test run using the familiar and orthodox techniques of drilling and bolting. To weigh every variable as impartially as possible, we used for this purpose a light touch punch press weighing only 75 lb. First, the workmen assigned to this phase of the demonstration marked the places for the bolt holes in the cement. Then the holes had to be drilled, sleeves driven into the hole, back into position, shimmed,

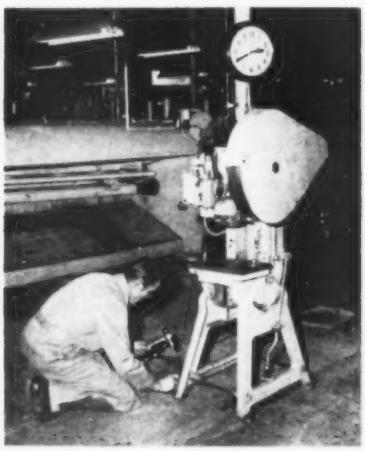


Fig. 1. First machine moved into the demonstration area was a small press which weighed approximately 75 lb. First step in job was to mark the floor

Fig. 2. Here is the scene 10 minutes after the demonstration had begun. The operator, having marked the floor, is now drilling holes for the lag bolts

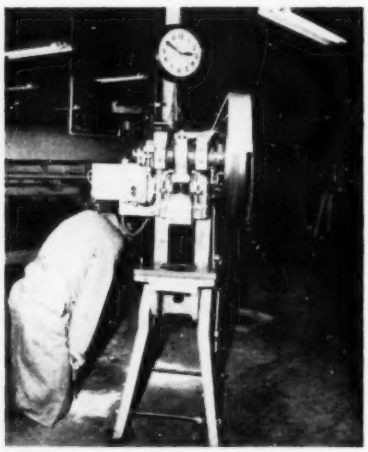


Fig. 3. The first hole for the new lag bolts has been completed after a time lapse of 10 minutes. Here at 2:50 the operator has started on second hole

Fig. 4. A few minutes after three the operator is still working on the holes into which bolts will be placed. Raw material in background is for later use

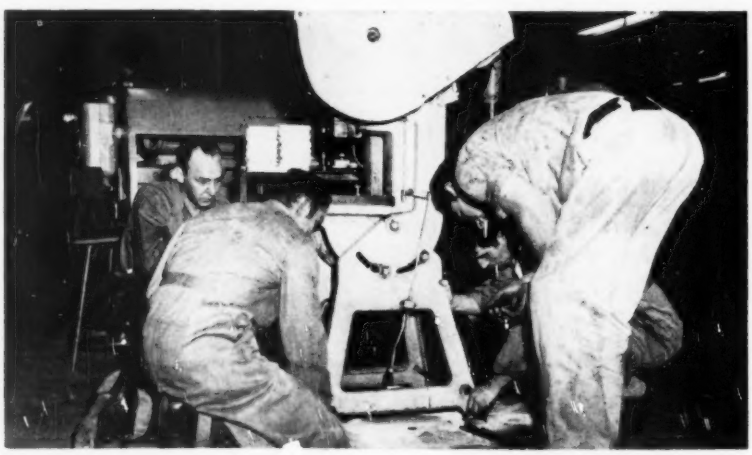


Fig. 5. Approximately one-half hour after the demonstration started the machine, having been lifted on to the bolts, is being fastened to the floor. Three and one-half minutes after this photograph was taken the machine was in operation. It took 33½ minutes to drill the holes, mount machine, put it in operation

and screwed down. Despite the fact that this machine was a relatively simple problem since it was light enough for manual lifting and adjustment by three men, it was 33½ minutes from starting time before its switch could be thrown.

With our new leveling mounts, bolting and lagging was, of course, unnecessary. Electric fork lift trucks reached underneath the assembly line machines to be replaced, and speedily moved them out of the demonstration area. Other trucks picked up the replacements, and advanced them into position. In 13 minutes the first machine had been connected to its power source and was actually operating.

Results of this test disclosed significant defense implications for the mounts. They can play a vital part in speeding necessary changeovers and revisions in plant layout that accompany industrial mobilization.

First and foremost, the test showed how flexible and readily adaptable a plant layout resting on these mounts can become. Flexibility—the capacity for quick change in response to new situations—is of prime significance in many industrial environments. The quality of flexibility that such units can bring to a plant has at least five important aspects:

1) You can afford to make, acknowledge, and correct mistakes in initial plant layout. When you set up for a new product or line, your first guess at locating a machine doesn't have to be the irrevocable best. If you've never operated in a particular location before, no matter how many textbooks you use, you can't know the optimum situation, until you actually start moving the material around and operating the plant.

2) Conversion speed gives a competitive edge. One user of these mounts is a major appliance manufacturer, whose experience illustrates this advantage of the equipment. The heavy appliance industry, like many others, is highly competi-

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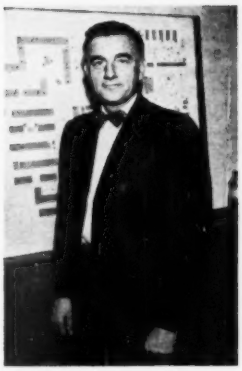


Author Harold Wrigley, Plant Manager, standing before layout of production floor. Previously Mr. Wrigley had been Chief of Inspection, Detroit Branch, Stone & Webster Engr. Corp.

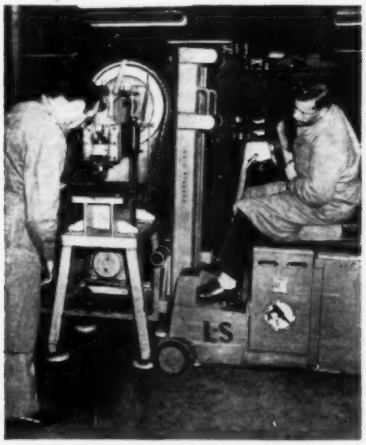


Fig. 6. Demonstration showed how easily machines may be moved by fork trucks. Machines which were much larger than this were moved easily

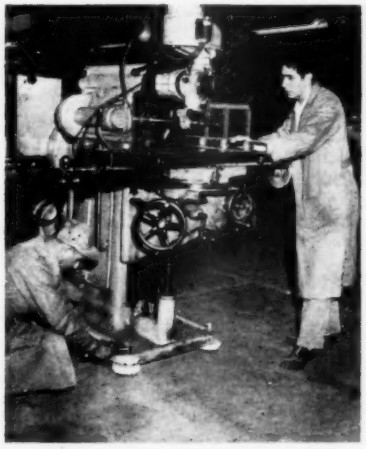


Fig. 7. Leveling is a single operation. While one man tests level of machine, another adjusts bolt on mount. Necessity occurs when floor contours vary

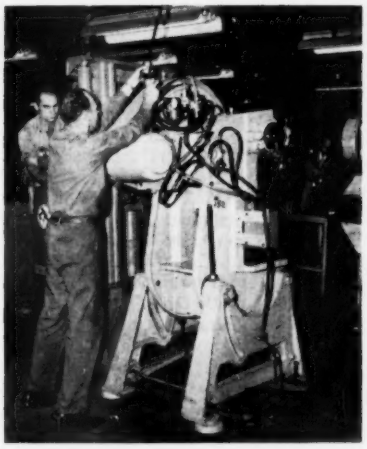


Fig. 8. Machines mounted on the new vibration isolators are coupled to electric power and air systems as soon as they are in correct position on floor

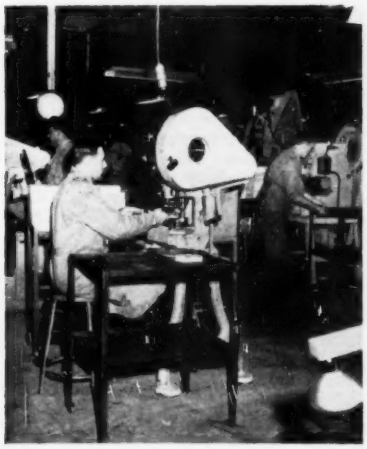


Fig. 9. At five minutes to three most of the machines mounted on isolators are in operation. Truck used to transport machines is leaving after delivery

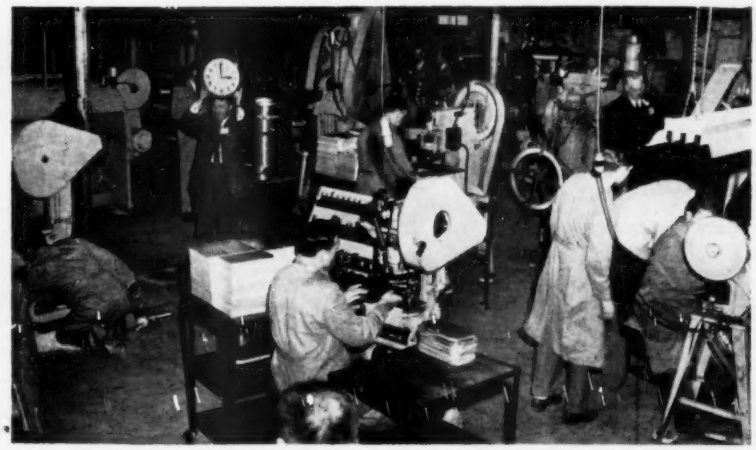


Fig. 10. Twenty-two and three-quarter minutes after the demonstration started all eight machines on isolators are in operation. All of these machines were producing as though they had been in the areas since the day work began. On the left can be seen the first machine still in the process of being bolted

Plant engineers from near and far who attended the Plant Engineering Society get-together at Phil Smidt's Restaurant on November 17. The four societies represented at this gathering were: Plant Engineers of Calumet Region; Chicago Plant Engineers' Society; Plant Engineers' Club of Marion, Indiana; and Plant Engineers' Society of Northern Illinois

While Old-Timers Got Together . . .

MEMBERS FROM FOUR Plant Engineering Societies attended a get-together at Phil Smidt's Restaurant in Hammond, Indiana, on Nov. 17. Societies represented were: Calumet Region, Chicago, Marion, Indiana, and Northern Illinois.

Plant engineers from the Calumet Region who attended were: Ed Bryzgalski, Standard Forgings, Corp.; Jim Rosenberg, Marbon Corp.; Fred J. Donkin, Federated Metals Div., American Smelting and Refining Co; Max Bote, McGill Mfg. Co., Inc.; Gunnard Nielsen, McGill Mfg. Co., Inc.; Ed Enoksen, Rand McNally and Co.; W. M. Graham, American Maize Products Co.; Ed Hanford, Lever Bros.

M. D. O'Hern, American Steel Foundries; Otto J. Seidl, Combustion Engineering, Inc.; Cliff Leisure, E. I. du Pont de Nemours and Co., Inc.; H. J. Chasteter, U. S. Reduction Co.; C. W. Taylor, Marbon Corp.; Al Schuler, U. S. S. Lead Refining, Inc.; Carl Jung, Swift and Co.; Ray E. Roehrick, Combustion Engineering, Inc.

A. W. Terry, Keyes Fibre Co.; Harry Gahagan, General American Transportation; W. V. Kaun, Cities Service Oil Co.; and John Lyon, Jim Morrison, F. N. Bodenschatz, R. L. Jones and Harold Harmon, all of American Steel Foundries.

The Chicago Plant Engineers' Society was well represented by: K. N. Banthin, Visking Corp.; George A. Heinze, Aldens, Inc.; George Garrety and George R. Bayer, of Continental Can Co.; Robert H. Paxton, Container Corp.; P. N. McMaster, Pullman Co.; H. J. Wagner and H. E. Nelson, of Pheoll Mfg. Co.; D. F. Redman and H. J. Serthen, of International Harvester Co.

H. B. Zoeter, C. J. Tyle, W. F. Saville, R. D. Post and F. C. Leichner, all of Continental Can Co.; J. R. Haugan, Union Special Machine Co.; E. A. Le Gros, Lever Bros.; Don Brown, Corn Products Refining Co.; R. J. Burgess, Bauer and Black; E. M. Butwell and R. F. Witt, of Link Belt Co.

L. A. Dickerhofe, Helene Curtis Industries; H. C. Ure, Flintkote Co.; R. G. Hodge, Ford Motor Co.; W. E. Gardner and D. F. Vater, of Cracker Jack Co.; Ted S. Ramond, Goodman Mfg. Co.; Chet Burns, A. B. Dick Co.; M. J. Anderson, R. Baumle, H. Hubbard, all of Illinois Tool Works; C. A. Lamb, and Eugene Filewicz, of American Brake Shoe Co.; Frank J. Schneider, Quaker Oats Co.; and Clayton Verlo, The Richardson Co.

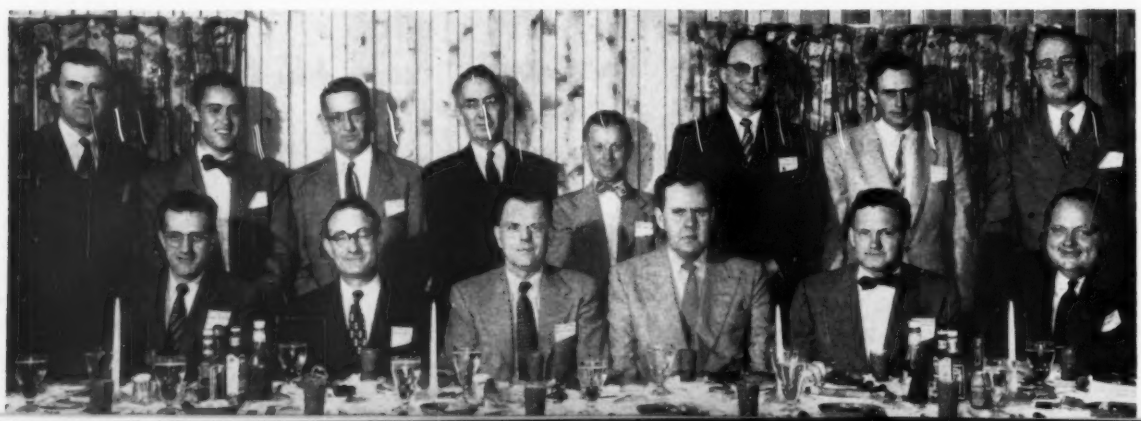
Plant engineers of the Northern Illinois group present were: Art Miller, Johns Manville Co.; Joe E. Church, Fansteel Metallurgical Corp.; R. F. McShane, Public Service of Northern Illinois; K. W. Wells, Abbott Laboratories; R. J. Gordon, Griess-Pfleger Tanning Co.; and S. A. Simonson, Chicago Hardware Foundry Co.

Members of the Plant Engineers' Club of Marion, Indiana, who traveled a distance of 150 miles, were: C. C. Bishop, and Matthew J. Kwolek, of Anaconda Wire and Cable Co.; R. S. Goldthwaite, Rutenber Electric Co.; E. M. Messersmith, Dana Corp.; and C. H. Marks, Indiana and Michigan Electric Co.

PLANT ENGINEERING magazine was represented by Richard H. Morris, Editorial Director; Tom Hanson, Editor; and Rocky Marinello, Associate Editor.

. . . Toledo Held Its First Meeting

Attending the organizational meeting of the Toledo Plant Engineers' Society on November 17 were: seated, left to right, H. L. Bahlman, Cooper Tire & Rubber Co.; M. C. Powell, Doehler-Jarvis Div.; Walter De Mars, Grace E. Smith Co.; R. W. Jones, Doehler-Jarvis Div.; (temporary chairman), Andy Anderson, Plant Engineering magazine; W. S. Duncan, Home Packing Co.; standing, left to right, Scoop Skubik, Plant Engineering magazine; R. J. Smith and R. L. Forrester, Surface Combustion Corp.; A. M. Nickels, City Auto Stamping Co.; L. R. Robitaille, Martin Parry Corp.; R. P. Winters, Interlake Iron Corp.; J. E. Dipert, Gar Wood Industries; and C. B. Williams, Libbey-Owens-Ford Glass Company.



Insulation Serves Many Uses at Norton Co.

Insulation is playing an important role in Norton Company's new Grinding Machine Plant . . . In addition to its usual job of reducing heat loss, it also helps prevent caking of raw clay in the bond plant . . . An unusual application was in insulating two locomotives which hold enough steam for half day's hauling operation in plant

By **RONALD G. MACINTYRE**, Superintendent of Power and Heating, The Norton Co.

EVERY ASPECT OF construction and equipment in our new Grinding Machine Plant at Worcester, Massachusetts, was planned carefully and thoroughly with special emphasis placed on thermal insulation.

Thermal insulation is often given only perfunctory consideration, but at our new plant it was engineered and applied throughout the plant, inside and out. It is serving two purposes at the new plant. First, thermal insulation helps reduce heat losses to a minimum in order to keep steam production costs low. Second, and even more important, the insulation is directly or indirectly responsible for the smooth, continuous operation of some of the manufacturing processes, whose interruption might cost the company thousands of dollars in lost production.

Insulation Applications

Thermal insulation is to be found almost anywhere on the plant property. It is, of course, on all steam transmission piping and steam generating equipment and auxiliaries in the power plant.

Perhaps the most outstanding of these is the 3200-ft steam main extending from the power plant to the new Grinding Machine Plant. Consisting of 16-in. and 14-in. piping, all of it located outdoors, this entire line was insulated with a 3-in. thickness of 85 per cent Magnesia, protected with a layer of 55-lb asbestos roofing felt, and secured with 14-gage copper wire every 6 in. Condensate return piping, also outdoors, was insulated with 2-in. thick magnesia, and similarly finished.

It is worth noting that this insulation stood up remarkably well under the impact of the Worcester tornado. Only minor mechanical damage was suffered by the insulation, the result of flying debris. Damage to insulation and other plant facilities was repaired in short order and the plant placed back into somewhat curtailed operation within a week.

In the Grinding Machine Plant itself, 85 per cent Magnesia was also applied to the entering steam mains as well as to all steam distribution piping, flanges, valves, fittings, traps and other appurtenances. Originally some of the main valves and reducing station in the plant had been left uninsulated. However, when workmen in their close vicinity complained of the heat these were radiating, plant engineering immediately made arrangements to have insulation applied. Thus insulation contributes to personnel comfort and morale as well.

Steam used in the various buildings for heating and process work is generated in a central power plant. Three Riley pulverized coal-fired boilers are each capable of generating some 50,000 lb of super-heated (750 FTT, 680 psig) steam per hour. In addition, two low pressure (440 FTT, 125 psig) 500-hp boilers are also in the plant for standby purposes. In an average year our plant will consume approximately 25,000 to 30,000 tons of coal.

A General Electric turbine, rated 2500 kw, supplies about one third of Norton's electrical power needs; the remainder is purchased from the New England Power Co. By ex-

Fig. 1. Reducing valves, strainers, flanges and traps in plant were insulated

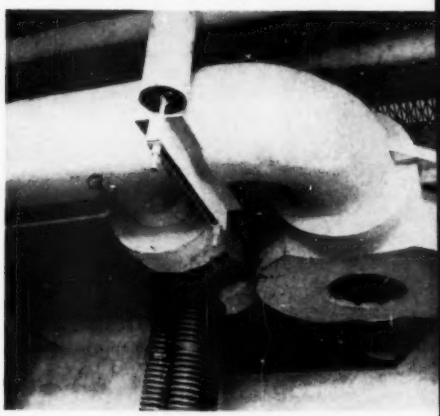


Fig. 2. Insulation was also applied to steam mains in the central power plant

Fig. 3. Insulation on dust collector of bond plant eliminates clay caking

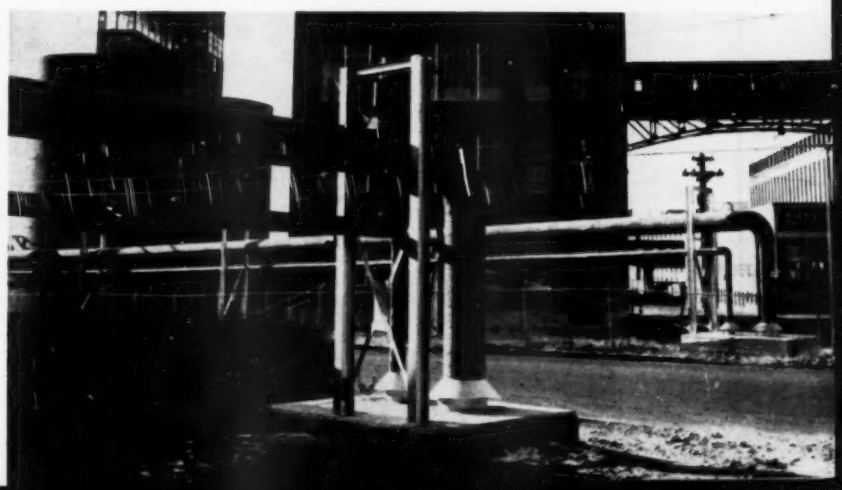


Fig. 4. Where steam main crosses road, it was buried in underground conduit

Fig. 5. General view of one of the five manufacturing bays at the Worcester plant. One of the steam lines can be seen in upper portion of the illustration

tracting steam from the turbine at two stages and using it for heating and process work, the power plant's overall efficiency is further improved.

Steam bled at 120 psig is used in steam heated molds, and steam at 3 psig is fed into the abrasive dryers. Both the molds and dryers are insulated with 85 per cent Magnesia in order to reduce heat loss and to avoid undue temperature fluctuations.

The 120-psig steam is also used to atomize the No. 2 fuel oil fired in the tunnel kilns. It might be argued that it is wasteful to burn the much more expensive No. 2 oil when probably No. 6 or even Bunker C might do the job as well. However, several good reasons justify the use of No. 2 oil.

First of all, several million gallons of fuel are burned per year, and must be pumped distances as much as half a mile. The lighter fuel eliminates the need for preheating to make it fluid. Second, compared to other types, the No. 2 oil presents almost no maintenance problems.

Third, and perhaps most important, because an unwanted shutdown of a single 375-ft kiln has at times been "guesstimated" to cost the company something like one million dollars in operating costs and lost production. In any case, it would involve a very large sum, and it can be seen why the more expensive fuel was chosen. This is also the reason why a supply of adequate atomizing steam at the right pressure and temperature is so critical, and why the insulation on supply piping plays such a vital part.

Insulation Reduces Caking

At the bond plant, where dry powdered clay is processed and stored, insulation solved a problem that had long plagued production engineers. Raw clay received from suppliers may contain up to 20 per cent moisture. By means of a Raymond pulverizer and flash drying unit these lumps of clay are reduced in size so that at least 95 per cent will pass through a U. S. standard 320 mesh screen, and have a moisture content not exceeding one per cent.

The excess moisture, removed as steam along with a high concentration of clay dust, used to condense in the dust collector and cause considerable caking on the felt filters. The answer was insulation. When 4 in. of 85 per cent Magnesia was applied to the casing of the dust collector, caking was drastically reduced and this production bugaboo in many cases eliminated.

Norton also Insulates Two Fireless Locomotives

PERHAPS THE most unusual application of 85 per cent Magnesia can be found literally traveling the length and breadth of Norton Co. property. It is a 4-in. thickness of this insulating material applied to the company's two work-horses, affectionately called "steam bottles."

In effect these are two fireless switching locomotives, which haul raw materials and finished products into and out of the plant. Instead of individually firing coal or other fuels to obtain steam, these locomotives are charged up at the central power plant, taking on saturated steam at 440 psig.

In operation, this steam is passed through control valves, since the engines are designed for a mean effective working pressure of 70 psig. The "boiler" of each locomotive holds enough steam to keep it in operation for about half a day, and while one is being used, the other is getting a refill. Because of the heavy insulation, heat loss and condensation are almost negligible.

Fig. 6. Illustration shows one of the two fireless locomotives which haul freight into and out of the plant. Insulated "boilers" receive steam from central power plant and can hold enough for a half day's operation

Group of plant engineers and guests who attended the testimonial dinner meeting of the Chicago Plant Engineers' Society

Chicago P. E. Society Honors Plant Engineering

PLANT ENGINEERING MAGAZINE was doubly honored at the December 4 meeting of the Plant Engineers' Society of Chicago. Richard H. Morris, Editorial Director, PLANT ENGINEERING, was presented with a testimonial scroll, and both he and Tom Hanson, Editor, PLANT ENGINEERING, were presented with Honorary Life Memberships.

In addition to the presentations, the group discussed plans for the luncheon they are sponsoring for the members of other Plant Engineering Societies throughout the country who will attend the Plant Maintenance and Engineering Show, at the International Amphitheatre, Chicago, from January 25 through January 28. The luncheon is planned for Wednesday, January 27.

Members of the various societies who wish to attend this luncheon should fill in the coupon appearing on page 4 of this issue and mail it to Ted Ramond, Plant Engineer, Goodman Mfg. Co., 4834 S. Halsted St., Chicago, Illinois.

Other plant engineers who are interested in having a society in their home cities are invited to attend this luncheon to meet those active in established groups.

Below: Chet Burns, President, Plant Engineering Society of Chicago, presents testimonial scroll (illustrated at right) to Richard H. Morris, Editorial Director, Plant Engineering

Charter members of the Chicago group pose with Plant Engineering editors. Standing: F. L. Leason, Jr., Interstate Bakeries; S. A. Simonson, Chicago Hardware Foundry Co.; Ted Ramond, Goodman Mfg. Co.; J. R. Haugan, Union Special Machine Co.; and H. B. Zoeter, Continental Can Co. Seated: Tom Hanson, Editor, Plant Engineering; Richard H. Morris; and Don Brown, Corn Products Refining Company

PLANT ENGINEERING SOCIETY OF CHICAGO
PRESENTS

A
TESTIMONIAL
TO

Richard H. Morris

Editorial Director of Plant Engineering Magazine in appreciation for his efforts in helping to organize this society by bringing the charter members together. His experience and knowledge in the field of the Plant Engineering profession has been utilized to further strengthen our group and to help us strive to solve mutual problems and promote the profession of Plant Engineering.
On behalf of the members of this group, we wish to extend our sincere thanks.

DECEMBER 4, 1953

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PRESIDENT

H B Zoeter
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T. S. Ramond
SEC.-TREASURER

PLANT ENGINEERS SOCIETY OF CHICAGO

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Fig. 1. Automatic machine tightens bolts on front cam section. After cam is assembled as part of the crankcase system, sub-assembly is put together, sent to next operation

Fig. 2. Pinion ring carrier machine automatically tightens the bolts and crimps the fasteners for the reduction gear pinions which are positioned in front section of engine

Automation Goes Aeronautical

Wright Aeronautical Division's new automatic assembly lines offer more production in less space . . . With a possible capacity 250 per cent greater than the old system, the present line occupies 42 per cent less plant space

AUTOMATIC MACHINES are playing an important role on the assembly line at the Wright Aeronautical Division of Curtiss-Wright Corp. The design of the new assembly line at Wood-Ridge, N. J., for Turbo Compound engines makes generous use of automation at many points.

The assembly line is designed in such a way that various models of the engine ranging in output from 3250 hp to more than 3500 hp can be built with the same equipment. In addition, the line is so set up that still more powerful models planned for the future can be assembled with the same technique.

This line replaces an earlier assembly line, built during World War II, which was automatic only to the extent that a floor conveyor pulled engines on stands past 25 assembly stations on a pre-determined time cycle. All other work was performed by hand.

When the original specifications for the new automated assembly line were drawn up, several requirements were established.

One was the ability to make engines in greater quantities without the need for additional plant space. On this score, the new line is extremely compact with respect to the number of engines it can produce. When completed, the maximum capacity of the new line was 250 per cent greater than the assembly system it replaced. Yet it occupied 42 per cent less plant space.

Before and after statistics will give a better picture of how compact the present line really is. The new line occupies 68,881 sq ft; the finished stores area, 27,783 sq ft; and the assembly tool crib, 1,050 sq ft. This makes a total of 97,714 sq ft compared to the 166,920 sq ft which

Fig. 5. After clamping the three crankshaft sections, the master and connecting rods are placed in position. The machine then automatically assembles these parts into a unit

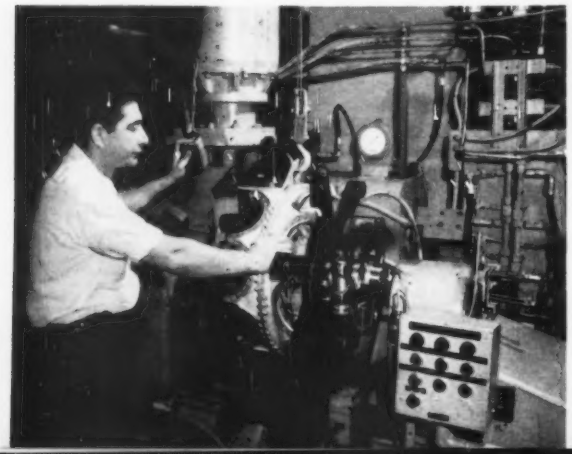

Fig. 6. The power section of the engine is lowered by overhead monorail to the special oil flow rig where the engine sub-assembly will be positioned for necessary pre-check tests

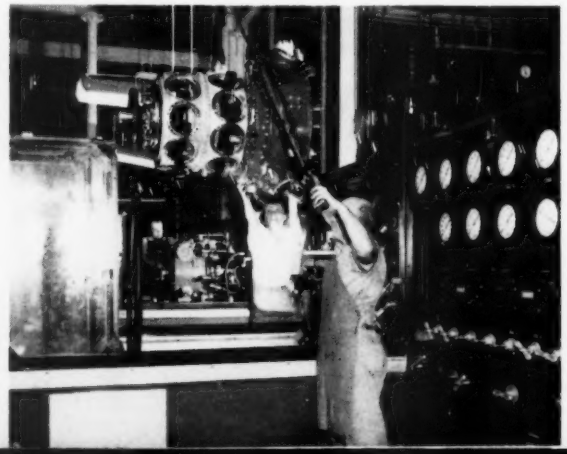

Fig. 3. This machine assembles the inner parts for each of the 18 cylinders. Machine locks springs into place, and is then reset to depress spring so rocker arm can be dropped in

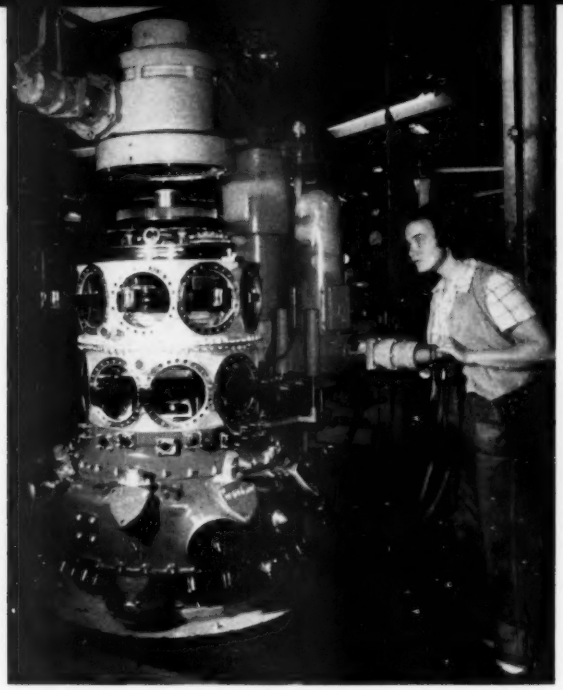

Fig. 4. Operator is shown bringing the automatic torque machine into position. This machine tightens and locks the reduction drive gear of power section of Turbo Compound

was the area of the entire assembly line before the change-over.

Another requirement was the ability to build engines quickly and more efficiently. Some of the automatic equipment now in use is up to 500 per cent faster than the best hand work on an identical operation.

One machine, for example, tightens the bolts holding a series of pinion gears to an identical torque and then, simultaneously, crimps the fasteners that hold them firmly in place. Another machine automatically locks in place the valve springs in every cylinder. Then, seconds later, the machine pushes down the valve spring again so that the rocker arm can be dropped into place.

A major factor in the speed and efficiency of the new assembly plan is a complete conveyor and belt system that moves parts along progressively from the time they are taken off the shelves in Finished Stores until they are ready to be applied to an engine.

From Finished Stores to the point of use, parts move in special pallets over roller conveyors. By the time the major portion of the engines have been built, floor conveyors are available to pull along the stands on which the engine is built up.

Such floor conveyors move engine stands down both the Green and Final assembly lines, from there through a wash booth toward the production test cells, following test, from a point near the test area, through the packing room.

The assembly procedure throughout is planned so that the engines are built up in three major subassemblies. One is the power section, another is the front section, and the third is the rear section.

Each of these units, when complete, is mounted on a special flow rig so that a pre-check can be made to determine whether working parts move freely and whether all oil and fuel lines and oil-tight passages are clear and perform properly.

All new engines are assembled on what is called the Green line. Once completed, they are mounted on a pre-oil rig that gives one final check on the accuracy of the assembly process.

Then the engine is washed in a spray house and mounted in a test cell where it runs for approximately four and a half hours under a routine that simulates conditons of flight operation.

Back from test, the engine is disassembled, its parts are washed in spray booths, and all pieces are inspected. The engine is then reassembled on another automated line—called the Final line—which is an exact duplicate of the Green line. Once more the completed engine is washed and tested before being sent to the packing room for shipment.

Fig. 7. Assembled engine, in pre-oil rig, is hooked up to simulate actual running conditions. Note the special engine stand which facilitates sub-assembly movement in plant

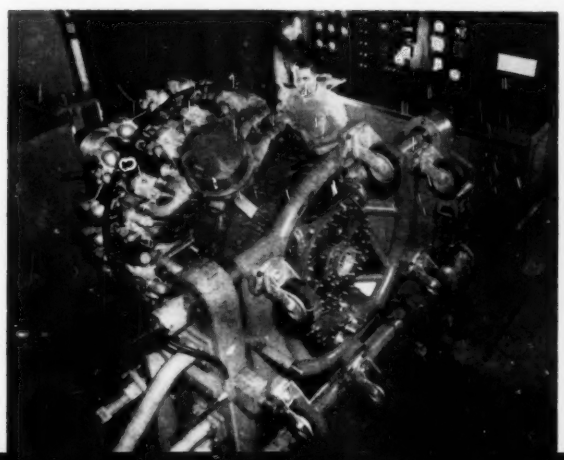

Fig. 8. Powerized conveyor lines carry assembled cylinders and pistons to operators for installation on engines. Each engine requires 50 pallets and about 60 ft of conveyor line

MOBILE LUNCH COUNTERS— Industry's On-the-Spot Caterers

Douglas Aircraft's switch from standard cafeterias to mobile lunch "trains," makes it possible to feed more employes in less time . . . Each train is its own "rolling cafeteria," with a driver-cashier, towing food carts

IN-PLANT FEEDING at Douglas Aircraft Corporation's Torrance, California, plant has been speeded up with the help of mobile lunch counters.

The big, reconverted Torrance facility has no plant cafeterias or restaurants. It has no fixed-position lunch counters. And more important, all employees take the same 30-minute lunch period, eliminating staggered eating.

Replacing standard, slower-moving cafeterias are twelve 3-cart trains—each loaded with identical menus. "Trains" are stocked in a central kitchen located at one end of a 900-ft long passageway which connects the plant's eleven production bays. Each bay has its own 200-capacity dining room—newly redecorated with removable Formica-topped tables, acoustical ceilings, asphalt-tile floors.

Just before the 11:30 a.m. lunch call, mobile trains roll out of the central kitchen, each pulled by its own battery-powered tractor. Each operator is assigned a station in the passageway outside a dining room. The train's operator plugs a single 440-volt line to a ceiling-rigged extension cord. This powers the "hot" car's electrical food warmers, the "cold" car's refrigeration system, and also an electric cash register located near the operator's seat.

As lunch time arrives, employes file past the carts—self-servicing in two lines at the rate of 10 customers a minute, compared to six a minute, the average in other Douglas plant cafeterias.

The entire system includes one of industry's most modern centralized kitchens, the nine dining rooms and 12, 3-unit "mobile lunch counters." Had cafeterias been installed to serve the anticipated 12,000 workers, they would have cost much more. More important, service personnel has been drastically reduced. Cafeterias operated at Douglas' El Segundo and Santa Monica plants require at least four servers on each line. Torrance mobile units need but one. Instead of four kitchens, the Torrance facility has only one—this is the complete central kitchen and bakery.

In an interview with PLANT ENGINEERING, John V. Thompson, Douglas' Welfare Administrator (whose department oversees in-plant feeding) and cafeteria manager S. L. Helm, explained the reasons behind the plant's new system.

Most important is the time factor. Restaurants and cafeterias in some industrial plants, blocks from production lines, waste hundreds of man-hours annually. Oftentimes to patronize a cafeteria, an employe must sacrifice 10-20 minutes of his lunch period.

Then too, the constant movement of employes to and from cafeterias creates traffic problems. Excessive traffic, coupled with rising employment, early forced Douglas and many another industrial plant to adopt mobile carts to backstop overcrowded cafeterias. Mobile carts made the rounds of production units catering to "the overflow."

Fig. 1. Mobile lunch trains—with hot dishes, cold drinks and sandwiches—speed along the central aisle of the Torrance plant on their way to the dining rooms

Employes Like It

Employes quickly took to the carts because they brought service right to the production line, saved long walks to cafeterias. Employes discovered that carts gave them more lunch-time, more leisure in which to eat. But until Douglas' revolutionary mobilization of its in-plant feeding carts—even the best of them—had been merely considered auxiliary units.

From the production angle, crowded cafeterias and skyrocketing employment forced staggered lunch shifts. At Douglas' other plants, for example, lunch is served in half-hour shifts between 10:48 a.m. and 1:10. There are three, 30-minute shifts. The staggered lunch system helps thin cafeteria crowds to manageable numbers—but it plays havoc with production.

At Douglas' Torrance location, everyone eats at the same time. No department is ever "out to lunch" while another desperately seeks a needed blueprint or technical assistance. When lunch is over at Torrance, work begins throughout the plant.

"From the economic angle," says Welfare Administrator John V. Thompson, "mobile lunch counters will save us, we're sure, hundreds of thousands of dollars. Just last year we installed a 400-capacity cafeteria at the El Segundo plant. We'd need four that size to take care of the Torrance plant—probably more as employment reaches the estimated top figure. Yet we have here at Torrance one kitchen which will serve all nine dining rooms. And 12 mobile units—an electric-

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Fig. 2. Carts, waiting to be stocked, are plugged into wall outlets to keep cold sections cold and hot compartments warm

Fig. 3. Battery recharging station in central kitchen sees to it that each "workhorse" is ready to do a day's work

driven tug, a hot and cold cart—which will serve the same number of patrons as four or five cafeterias."

"Kitchen and service personnel can also be reduced," continued Thompson. "We'll use but 25 people per shift, on two shift service. That's a total of 50. At El Segundo, we employ 40 a shift—a total of 80. Forty of those people tend our cafeteria lines alone, compared to twelve each shift at the Torrance plant."

Moreover, cafeteria manager Helm points out that the Torrance facility's central kitchen has no dish-washing area. "We don't have any 'returns' to the kitchen. All food is served in disposable plastic and aluminum containers, all food eaten with plastic throw-away utensils. We have no dish-washing problem."

A roaming "refill" train keeps mobile units stocked, although a telephone to the kitchen is close by each mobile station—so the train's operator-cashier can call for reinforcements.

While mobile carts are in use without dining rooms in some plants—but only as auxiliary feeders—the objectionable feature is that employes must take the food either to their work benches or find some place else to eat. This is hardly conducive to a lunchtime "rest," nor to food enjoyment. Besides, morale-wise, plant management want their people to get away from the work bench during lunch hours.

Hence, Torrance's small, "family style" dining rooms. Each, incidentally, has a phone booth, cigarette machine, and can be divided into four lunch rooms by accordioned partitions. Dining rooms will serve, outside of lunch hours, as conference rooms.

Three-Car Train

Mobile lunch trains, designed by restaurant equipment dealer Stan Abrams and Claud Riddle, Douglas Plant Engineering supervisor, consist of three cars—the 'tug' and two stock units, one with refrigeration, one with heating units. A girl drives it to a dining room position, then parks. The driver's seat revolves for service so she faces the two lines of self-serving employes. The driver now becomes the cashier—tending the electrically-operated cash register.

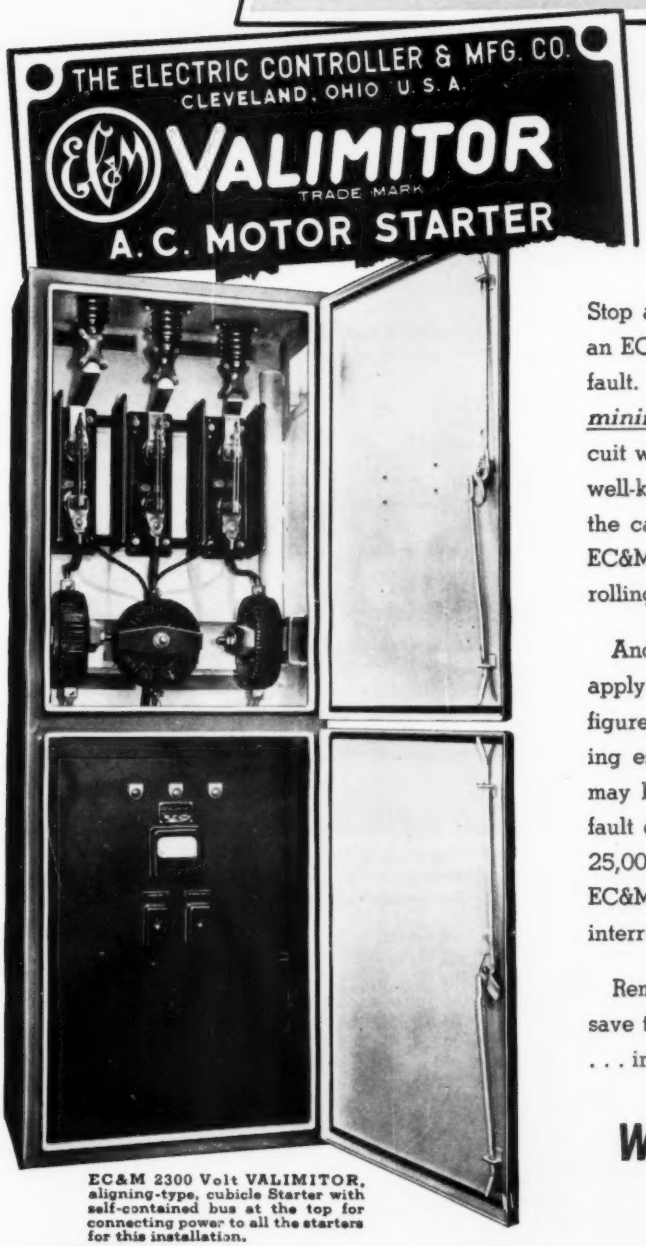
The first cart behind the 'tug' is for cold foods. However, the 'tug' itself carries: two 5-gal cold drink containers, flatware (plastic), napkins and condiments. The "cold" car—stainless steel constructed like the rest of the train—contains: automatic cup dispensers, sugar dispensers, a 17-gal coffee dispenser; a refrigerated unit (with its own compressor) for cold drinks—juices, milk, pops, etc.; and ice-cream freezer unit.

The "hot" car has a deep-well, strip-heater installed warming section for hot dishes. Each is served in a disposable aluminum (aluminum foil) covered dish or box—its contents noted on the aluminum lid. The lid is soft enough so that a stylus is used to mark the contents, writing directly on the metal. Above the warming compartment are shelves stacked with sandwiches—each individually wrapped and labeled. Each train carries an identical assortment of 35-40 items.

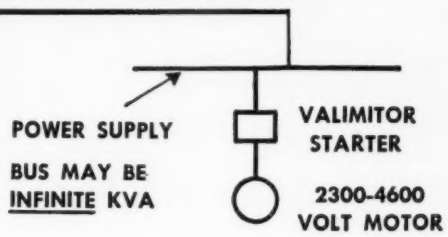
Fig. 4. Driver of mobile lunch train also becomes the cashier when the train arrives at its assigned station in the plant

Fig. 5. Individual dining rooms are served by mobile carts. Note partitions which can be closed to make four rooms

RESTART in a matter of seconds -- no parts to replace --PAYS for itself, if there's ONE FAULT



EC&M 2300 Volt VALIMITOR, aligning-type, cubicle Starter with self-contained bus at the top for connecting power to all the starters for this installation.



Stop and consider the reduction in down-time an EC&M VALIMITOR Starter will *save* after a fault. Damage in the motor circuit will be *minimized* by the VALIMITOR coils—the circuit will be cleared *quickly* and *safely* by the well-known Type ZHS magnetic contactor. When the cause of the fault has been remedied, the EC&M VALIMITOR starter will get production rolling again in a matter of seconds.

And EC&M VALIMITOR Starters are easy to apply on a system of *any* capacity. No need to figure "short" capabilities of existing bus including estimate for future growth. These starters may be applied to a bus of infinite KVA . . . fault currents will be limited to a maximum of 25,000 KVA (steady state current) and the EC&M Type ZHS Contactor of 50,000 KVA interrupting capacity clears the circuit quickly.

Remember that EC&M VALIMITOR Starters save time . . . in application . . . in installation . . . in restarting after a fault.

Write for **T9-117**

Reprint Bulletin

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

For more facts circle 568 on Reply Card

New Ramp Adds Flexibility to "Piggy-Back" Trailer Handling

Fast-growing "piggy-back" movement of highway trailers on railroad flat cars has been spurred by the innovation of a portable magnesium ramp for loading the trailers on the rail cars.

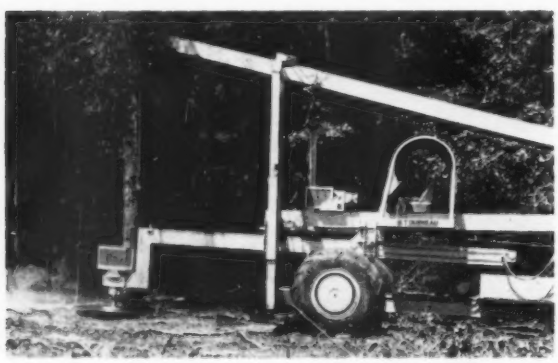
Developed by the Magnesium Co. of America, and placed in service by the Chicago and Northwestern Railroad on its Chicago-Milwaukee run, the "Traileramp" adds speed and flexibility to the carloading operation.

Replacing the end loading process, with its fixed ramp at the end of a stub or dead end track, the ramp operation permits loading trailers on cars at any point where the string of cars can be broken for access by the truck and trailer. Unloading selectivity is also provided, by use of the ramp, since any desired car can be unloaded first at its destination.

The ramp is the largest single unit ever fabricated from magnesium. It is 45 ft long, 9 ft wide (flaring to 11 ft at the ramp ends) and weighs 4800 lb. A manually-operated hydraulic system raises and lowers the ramp into position, and it is fitted with rubber-tired wheels.

Mobile Self-Powered Saw Cuts Trees "At Arm's Length" to Clear Land

Self-powered, mobile tree saws clearing land at better than two acres per hour are a feature of a new line of land-clearing equipment being used on the Texarkana, Texas, Reservoir area. R. G. LeTourneau, Inc., Longview, Texas, is the manufacturer of the equipment being used on the project. Clearing operations at the 16,000-acre area are in preparation for the creation of a holding pool on the Sulphur River as part of a flood control system.



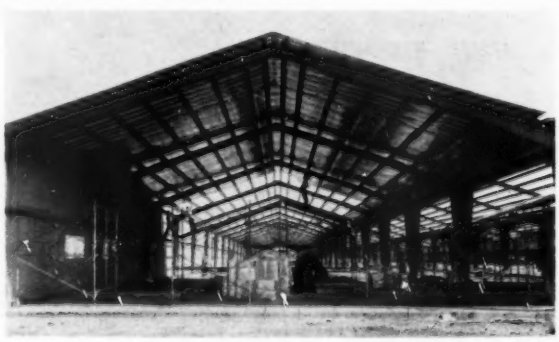
The new LeTourneau equipment embodies the principles of diesel-electric drive and four-wheel steering, with individual electric motors powering each wheel and separate steering motors for front and rear wheels.

The Tournasaw is characterized by an electrically-powered circle saw on a pivoting boom which will selectively cut all the trees in a 250-sq ft area in front of the Tournasaw, and an overhead "pusher boom" which directs the fall of trees in parallel positions. Directional felling keeps the path ahead of the Tournasaw clear and makes decking and burning a much simpler operation. Also of advantage is the ability of the saw to cut trees flush with the ground, leaving no impeding stumps.

Construction Coordination Gets Building Erected in Record Time

A speedy building project, accomplished through the use of modern construction methods and materials, has produced a huge 150 ft by 500 ft display building, constructed in only 56 working days, at a cost of 19 cents per cu ft.

Design of the building is unique in that prefabricated Fiberglas-insulated Marietta Concrete panels were fastened to standard Butler steel framing. Construction teamwork played a major part in the erection, since several phases of the work were carried on simultaneously.



As soon as the foundation and concrete floor slab of one 50-ft bay were completed, the steel framework was erected on that portion. As the frame took shape, prefabricated concrete panels were lifted directly from delivery trucks to their position in the wall.

As the walls went up, the contractor began installing 75,000 sq ft of Fiberglas flexible foil-faced insulation in the ceiling. This coordinated construction, together with the choice of materials, provided the efficiency that resulted in the record erection time.

Used in the Most Prominent Buildings

POWERS

WATER TEMPERATURE CONTROL

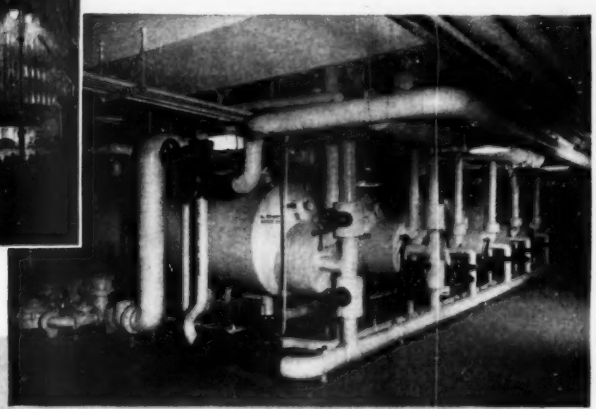
In Boston's Famous Landmark

John Hancock

MUTUAL LIFE INSURANCE COMPANY BUILDING

Water Heaters, six of which are shown below; 21 Shower Baths; 7 Dishwashers in the company cafeterias; Photostat Developing Baths for two large photostat machines . . . all are regulated by various types of POWERS Thermostatic devices especially suited for their particular use.

When problems of temperature control arise phone or write POWERS nearest office. With over 60 years' experience and a complete line of controls, some of which are shown below, we can help you find the right solution for your requirements.



Cram & Ferguson, Architects
McCarron & Sullivan Co., Plbg. Engineers; M. Ahern & Co., Contractor
Buerkel & Co., Heating Engineers & Contractors

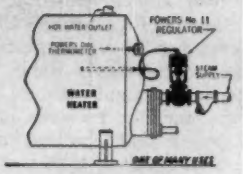
Powers ACCRITEM Regulator

Compressed air or water operated for controlling all types of water heaters, and diesel engines.

Powers FLOWRITE Valve

POWERS Thermostatic Water Mixer. Insures utmost comfort and safety in showers. Many other uses.

POWERS Easy to Read Dial Thermometer



POWERS No. 11 Self-Operating Temperature Regulator for water storage heaters, hot water converters, dishwashers, fuel oil preheaters, jacket water cooling for air compressors, and diesel engines, etc.

(b29)

Established in 1891 • **THE POWERS REGULATOR COMPANY** • SKOKIE, ILL. • Offices in Over 50 Cities

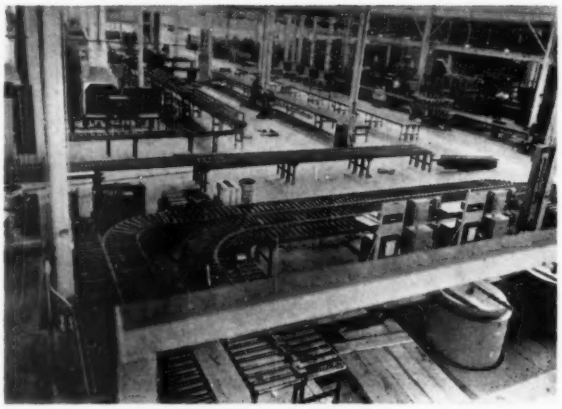
For more facts circle 569 on Reply Card

Handling System Keeps Magnet Production in High Gear

If you want to move materials fast, make your materials handling system do double duty. You step up production by saving time, go easy on expenditures for extra equipment and ease the strain on workers' backs.

That was the thinking of Carboloy Department of General Electric Company management in equipping the new Edmore, Mich., permanent magnet plant.

Every conceivable type of materials handling equipment is used to handle and process more than 2200 different shapes and grades of magnets at this $4,500,000 plant. In blanketing the 2-acre plant, more than 1½ miles of conventional conveyors plus belt and vibrator types are synchronized with bucket elevators, chutes, tote trays, monorails, electric hoists and fork lift trucks. This handling system gears a once very highly specialized job-shop operation into a production line setup.



From the time sand is delivered to the foundry section of the permanent magnet manufacturing plant until the cast magnets reach the shipping room, mechanical handling aids take over. In several areas, the work station itself is built-in as an integral part of the conveyor system or, a conveyor is utilized as a work bench so that work-loaded tote trays need never be lifted or removed while the work is being processed.

Service School Takes Preventive Maintenance Lessons to the Students

Extending its training program for customer personnel on the maintenance and operation of fork trucks, towing tractors, Ross straddle carriers and related materials handling equipment, the Service Division of Clark Equipment Co., has organized a mobile service school to take advanced training to the customers.

Restricted to those already familiar with general automotive maintenance and repair techniques, the course subject matter concentrates on recent developments in materials handling equipment, such as electric control systems and power drives developed recently by Clark-Dynatork and Hydratork. Operation and maintenance of various hydraulic systems are also covered.

Electronic Tallying Device Shows Promise for Plant Inventory

Electronics has appeared in a new industrial role, in a device that is expected to revolutionize inventory control in business and industry. Using the machine, it is possible to reduce to a fraction of a second the time necessary to check an entire inventory.

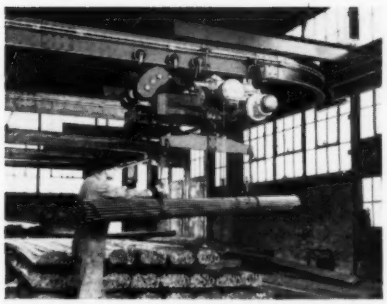
The new device, called a Distributon by its user, John Plain and Company, Chicago mail order house, was developed by the Engineering Research Associates Division of Remington Rand, Inc.

Housed in a small cabinet, about 7 ft long and 6 ft high, the machine receives information from ten keyboard devices that look like hand adding machines. The Distributon receives tallies of inventory items through the keyboards and within 4/10ths of a second has added the new item to the total in its proper catalog classification, and has registered the new total. It can handle 13,000 items in each three categories.

Remington Rand's electronics experts expect the Distributon system to be of great use, with certain modifications, for keeping a perpetual inventory control in any industrial plant requiring such a service for a large number of diverse classifications.

The system has four basic phases of operation — an input through the keyboards; a magnetic memory or storage drum, where the new item is matched with previous totals in its classification; an arithmetic section which performs the addition or subtraction; and an output section which on demand records the new total on a printing device.

MONORAIL *Pays!*

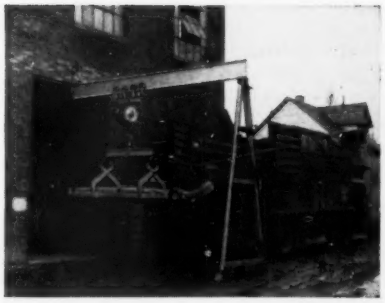


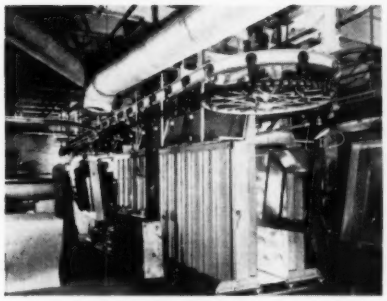
INCREASES TONNAGE

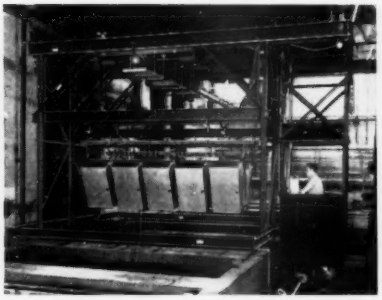
From 26 to 48 tons of steel rod per day was the increased movement produced by a properly engineered monorail system.

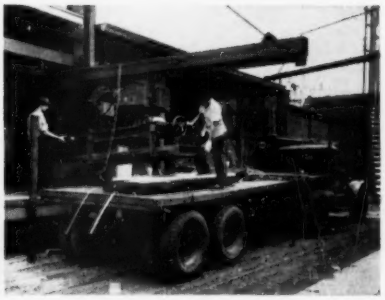
LOWERS COST

This simple system actually saved $150 in handling costs within four months of operation. No more sheet-by-sheet movement.









SAVES TIME

Passage, on monorail, of metal parts through infra-red dryer, cuts 70% from former drying time. All other handling in plant on monorail.

MORE CAPACITY

30% more capacity was added to metal cleaning process by handling a third more units on carrier with one man operation from cab control.

LESS LABOR

Operators claim to save 26 man hours per truck over former unloading time. Interlocking monorail cranes in the plant also reduce handling costs.

Write for Bulletin C-1
showing many more cases where MONORAIL PAYS!

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE **CLEVELAND 7, OHIO**

For more facts circle 570 on Reply Card

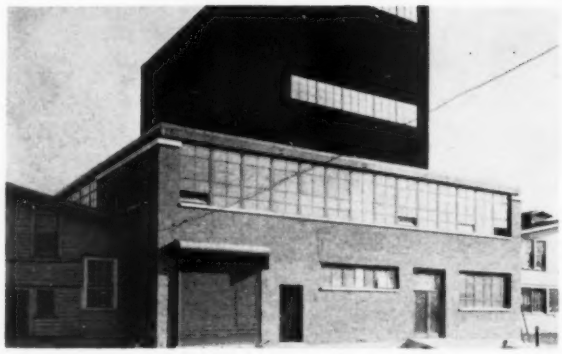
Well Equipped Laboratory Pays Dividends and Helps Industry

New laboratory of the Richardson Scale Co. in Clifton, N.J. is something new in the materials handling field.

A $150,000 investment, the laboratory which includes a complete machine shop, electrical lab, solids-flow lab and test quarters has paid off handsomely. Since 1952 when it was completed, the company has added over a dozen new items to its standard line of materials handling and weighing equipment, designed a host of special pieces of equipment for special field problems, and built a highly versatile and accurate instrument control system in the materials handling field.

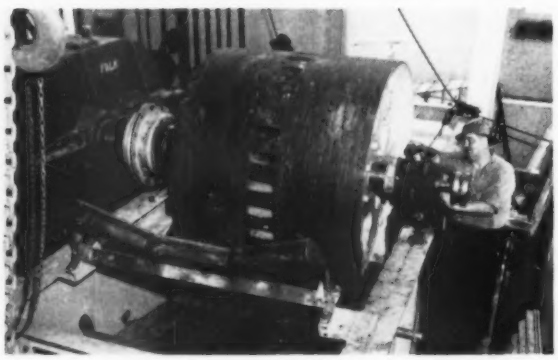
The test and development lab has the mechanical facilities and dimensions to work with big equipment under simulated process conditions. Purpose of this lab, which is probably the largest and most completely equipped materials handling lab found anywhere, is to test and improve standard lines of equipment, and fabricate and test new equipment.

The test lab has more materials handling equipment in it than some processing plants many times its size. Equipment includes a system of conveyors, elevators and garners. There are three garners and two bucket elevators feeding them. Capacities: 50 and 25 cfm.



The lab has come up with several new pieces of materials handling equipment since its opening. They include a giant packer for loading materials in one-ton containers, a Y-veyor that permits one operator to fill bags of bulk materials coming from two automatic packers, a remote-control system for formulating bulk products, an instantaneous tare-weighing process.

Outsized Electromagnetic Pulley Keeps Tramp Iron Out of Coal



Installed in the Oak Creek Power Station operated by the Wisconsin Electric Power Co., what is believed to be the world's largest electromagnetic pulley will magnetically remove all tramp iron from incoming coal. The unit, 60 in. in diameter, with a 48-in. face, will safeguard expensive equipment.

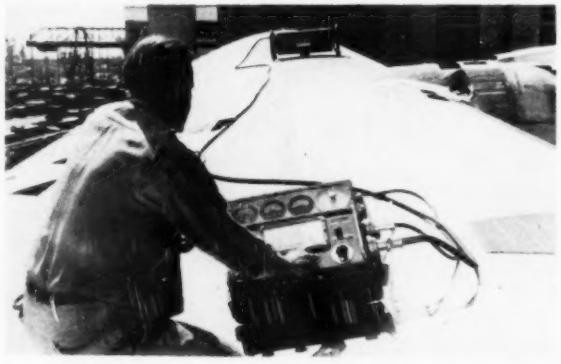
In addition to setting a new high in size, a new method of lagging has been developed for this type of equipment. This material, applied to the face of the pulley, increases its tractive effect with long conveyor belt runs. The pulley manufacturer, Stearns Magnetic, Inc., has pioneered in the application of a thin, tough strip of material with firmly embedded granules. Held to the pulley face with an adhesive, the lagging provides much more traction than was formerly achieved.

Portable Unit Facilitates Non-Destructive Testing in Field

Inspection of internal structural members of airplanes by X-ray is now recognized as an efficient and economical method by Lockheed Aircraft Corp., Burbank, Calif. Experimenting with X-ray equipment, Lockheed found that light-weight portable equipment made possible the radiography of internal blind areas.

Unlike other methods requiring laboratory setups, Andrex equipment, made by Holger Andreason, Inc., San Francisco, makes field radiography practical. Consisting of a control panel, power cable and X-ray tube head, with a total weight of 300 lb, it can be carried in an automobile—and operated on 110v, 220v, or 440v.

In one application, the X-ray tube head is placed on the top surface of the wing and the film is placed on the under side. Low tension cable extends from the tube head to the control panel where the operator controls the exposure. By using 14 in. by 17 in. film and overlapping each exposure, entire areas may be X-rayed quickly and easily. Lockheed simplifies the location

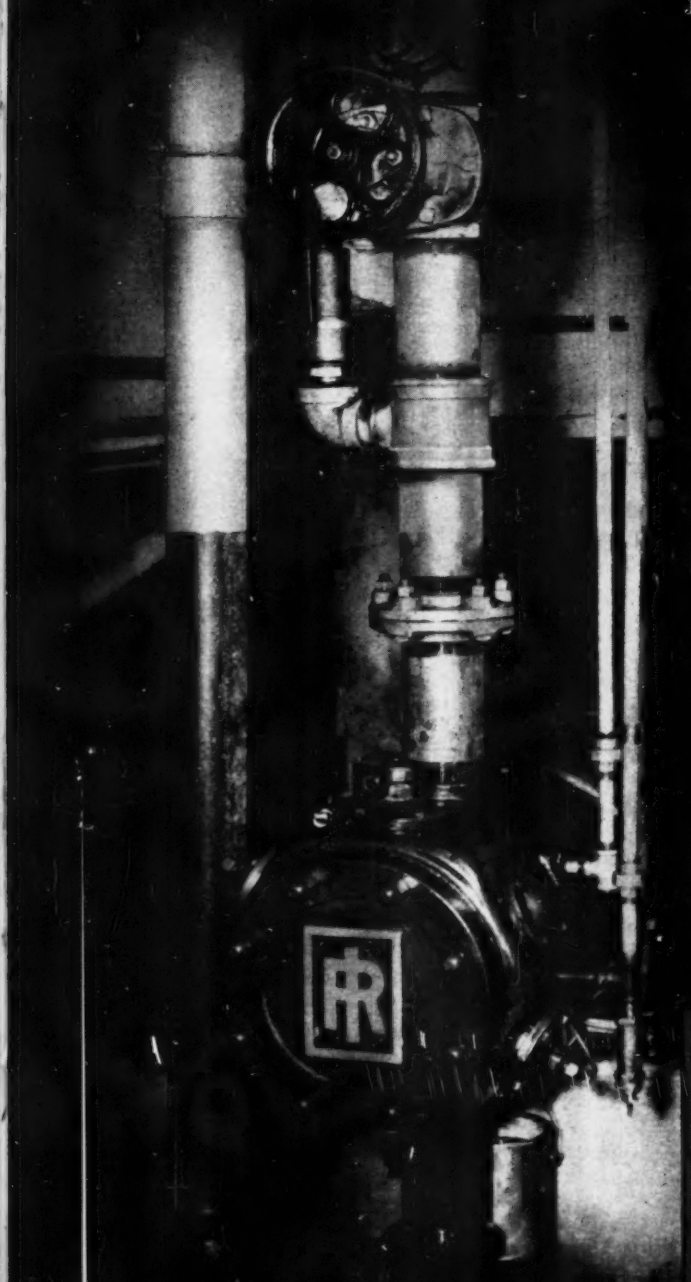


of any defect seen in the finished radiograph by identically numbering negatives and specific locations on a schematic drawing of the area X-rayed.

STAYNEW INTAKE FILTERS PROVIDE
Positive Protection
AT VICTOR INSULATORS, INC.

"INSTALLED IN 1947, THIS COMPRESSOR HAS OPERATED DAY IN AND DAY OUT WITHOUT MAJOR REPAIRS OR OVERHAUL."

Jim McKee, Maintenance Department Foreman



Pictured is Staynew Intake Filter installed on roof above compressor at Victor Insulators, Inc., Victor, New York.

EVEN under severe service conditions . . . air heavily laden with abrasive clay dust . . . a Staynew G-3 Intake Filter effectively guards this vital compressor. The Staynew Intake Filter actually operated at peak performance *two years* without attention. That's POSITIVE PROTECTION! An amazing record . . . duplicating those set by Staynew Intake Filters throughout all industry.

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ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

NEW PRODUCTS & PROCESSES

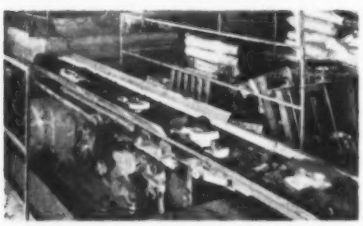
summarized for your convenience

Edited by M. E. Heniken

1—SHAKER CONVEYOR for hot or abrasive materials

Designed for operations involving hot and abrasive materials, these shaker conveyors move the materials horizontally, upgrade or downgrade for distances up to 500 ft. Several materials can be transported separately, it is pointed out, with the feed and discharge arranged at various points along the trough. Although intended for heavy duty, these conveyors are lightweight, portable and readily assembled, and they can be installed where headroom is limited. Capacity is 100 tons per hour.

A reinforced metal troughing utilized for both heat and abrasion resistance makes these conveyors adaptable to many operations in the cement, lime, steel and other industries. Powered by 10-, 15- or 20-hp electric motors, or 10- or 25-hp air motors, the conveyors can be supplied with trough sections rang-



ing from 12- to 36-in. widths, in 6- to 16-ft lengths, and in 6- to 18-in. depths. Angle sections are available for trough line turns. Goodman Mfg. Co.

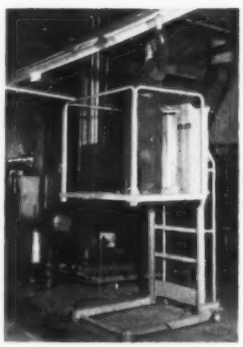
2—BUS DUCT is adjustable to fit those odd lengths

Standard bus duct comes in nine lengths from 2 to 10 ft, this company points out, so that a combination can be picked to span a space of 23 ft, for example, or 24 ft. But a distance of 24-ft 3½ in. has generally called for a specially made

section to manage that 3½ in. To cope with such problems, this telescopic plug-in bus section is offered. It can be made as short as 4 ft, or as long as 5 ft, or any length in between. A series of holes in the overlapping bus and in the housing is such that matching bolt holes can be found for any position over a 1-ft range, it is explained, and the housing has a telescoping arrangement to cover the same range. A similar arrangement offers a 5-to-6-ft length in low-impedance bus duct. Westinghouse Electric Corp.

3—LIFTING UNIT aids in overhead maintenance jobs

Introduced to meet the need for a lifting unit on which a man may raise and lower himself with a hand crank, the



Bootstrapper is a cantilever type unit with hand winch mounted on the carriage permitting the operator to raise and lower himself while standing on the platform. It has caster steer with a foot-operated floor lock mounted between the swivel casters. The model pictured has a lift of 5 ft; other Bootstrappers are available with higher lifts. Service Caster & Truck Corp.

4—SAFETY DEVICE to prevent crane boom accidents

By automatically cutting off power the moment the boom is raised too high, the Rud-o-Matic Thomas Boomstop acts to prevent boom kicking and twisting — stopping accidents before they start. Boom travel is stopped instantly, manufacturer says, without shocks and strains. Two models are available: Model 5000 for small cranes up to 20 ton capacity, and Model 10000 for those from 20 to 100 ton capacity.

Dual spring-loaded rams, mounted on the A frame or gantry of the crane, provide a cushioning effect and stop boom movement when a load cuts loose and boom whips back. The rams prevent the boom from being raised too high. Two vacuum valves operate the boomstop clutch and master clutch. A vacuum pump is used on diesel powered cranes; manifold pressure, on gasoline powered cranes. In operation, the first valve releases boom friction and stops boom travel when boom angle exceeds 85 to 88 deg. The second valve is set for 90 deg. If the operator should two-block the load line and pull the boom back, the second valve is designed to actuate the master clutch and stop boom travel before damage is done. Bulletin 101 describes this boomstop. McCaffrey-Ruddock Tagline Corp.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 37-38 and 185-186.

5—ADJUSTABLE V-BELTS are easy to couple, uncouple

TD and TE Veelos V-Belt, for D and E drives, is claimed to be the easiest V-belt to couple and uncouple. This link V-belt is made of plies of treated high-strength canvas duck, joined by riveted studs with removable cup-washers and T-screws. This combination is said to give greater strength and durability at all key points to enable the belts to be coupled and uncoupled easily. The belts are also said to provide maximum flexibility to last longer, and to run cooler and smoother. Two types are offered—a regular rubber coated for general service, and oil-proof for oily and high temperature drives. Manheim Mfg. & Belting Co.

6—HAND LAMP, rain tight, weighs less than 5 lb

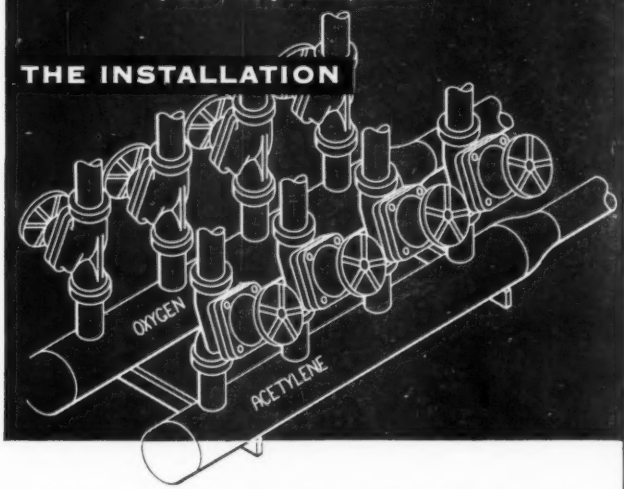
An explosion-proof, rain-tight hand lamp, the Type EVH-103, is described as about half the size and weight of previous lamps of its type. It is said to have much higher impact-resisting qualities than manufacturer's earlier models. Globe guard, globe-holder and cord connector housing of the lamp are aluminum, and receptacle housing, molded phenolic composition. Its globe is seated against a metal flange by a heat and impact-resistant globe guard, and tests are reported to show the globe cannot loosen even under severe shock.

Lamp chamber and handle are explosion-proof, and are separated by lamp receptacle. Flame-tight joints along the globe-holder, handle and cord connector prevent explosion in one compartment being transmitted into the other, it is explained, and these joints have five or more full threaded turns, which, after explosion, allow only cooled gases to escape. Pressure type wire connectors

This Valve Stops Hidden Losses

...in Welding Gas Systems, for instance

THE INSTALLATION



In a prominent New Orleans shipyard, with Crane Diaphragm valves listed as "standard operating procedure" for complete oxygen-acetylene system. Shown is typical installation on portable manifold.

VALVE SERVICE RATINGS

SUITABILITY:	100% effective – no leakage
FEATURES:	No seating stress on diaphragm
MAINTENANCE COST:	Zero
SERVICE LIFE:	Installed 2 yrs. – long life indicated
OPERATING RESULT:	Big savings on welding gas costs
AVAILABILITY:	Crane Catalog item – No. 1652

THE CASE HISTORY

Costly loss of welding gases was traced to the conventional packed valves formerly used on the system. Leakage through the stuffing persisted despite frequent, regular servicing of stem packing on the valves. This high maintenance cost added to the yard's loss.

The remedy was found in Crane No. 1652 packless Diaphragm Valves, Underwriters approved for the service. These valves stopped the leakage, and not one Crane valve has needed attention since installed more than 2 years ago. Despite continued expansion, the yard's costs for welding gas have been sharply reduced.

THE VALVE

The modern packless valve with Neoprene diaphragm that serves only to seal the bonnet. Its independent disc saves diaphragm wear, provides positive seating on fluid, even should the diaphragm fail. Choose from a wide range of body and trim materials for all kinds of corrosive and ordinary services. Sizes ½ to 6 in.; screwed or flanged ends. See your Crane Catalog, or your Crane Representative.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 572 on Reply Card

NEW PRODUCTS

(Begins on page 134)

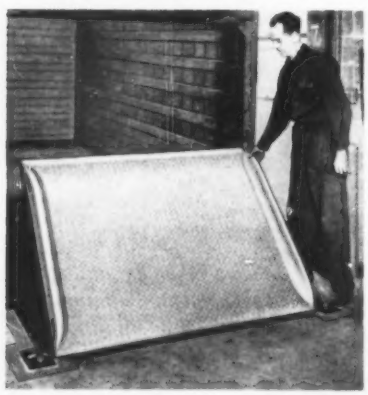
are used in the cord connector assembly to minimize danger of wires being pulled free under the strain of continuous wear, and to make cord replacement easier. Rubber bushings, supplied with the fixture, accommodate $\frac{3}{8}$-in. to $\frac{5}{8}$-in. portable cord. The fixture is illuminated by a standard 100-w rough service lamp. Crouse-Hinds Co.

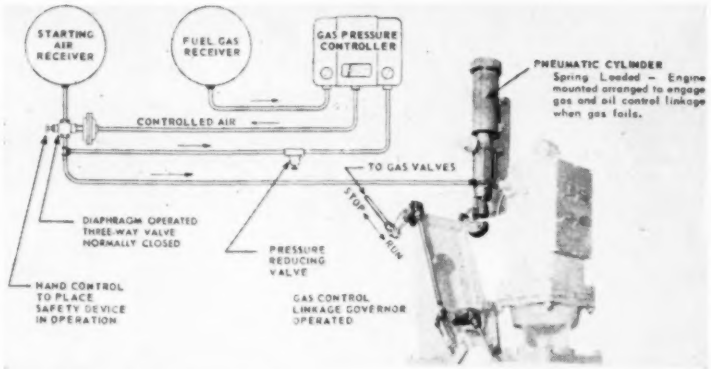
7—STEEL FLOAT TRAP for draining corrosive liquids

Made entirely of stainless steel, this float trap has been developed for draining corrosive liquids from air, gas and steam confined in piping systems and equipment. This automatic trap is designed to drain liquids as fast as they are formed, continuously without permitting the escape of air or gas. The trap mechanism consists of a valve and seat, a lever, and a ball float inside of a case—all made of stainless steel. The liquid, on entering the unit at the top, raises the float, opening the valve and permitting the escape of the liquid. An accumulation of any steam or gas lowers the liquid float, causing the float to drop. This action closes the valve. The trap is designed for 300 lb pressure and maximum total temperature of 800 F; it is made in sizes from $\frac{1}{2}$ to 2 in. The V. D. Anderson Co.

8—DOCK BOARD is lightweight, and easily handled

A magnesium dock board loading system, believed first of that material to be designed for permanent installation on concrete docks, is the Perma-Dock. The unit, which manufacturer claims will save approximately 65 per cent in initial installation costs, is declared light enough to be raised or lowered by one man without aid of power operated devices or counter balances. The recessed type of dock installation permits the dock unit to self-adjust to truck level, and is said to automatically compensate for truck spring deflection. The design of unit's safety curb is intended to prevent power-truck wheels from colliding with the curb rail, a major cause of tire damage. Magline Inc.




STARTING AIR RECEIVER
FUEL GAS RECEIVER
GAS PRESSURE CONTROLLER
PNEUMATIC CYLINDER
Spring Loaded — Engine mounted arranged to engage gas and oil control linkage when gas fails.
CONTROLLED AIR
TO GAS VALVES
STOP
RUN
DIAPHRAGM OPERATED THREE-WAY VALVE NORMALLY CLOSED
PRESSURE REDUCING VALVE
HAND CONTROL TO PLACE SAFETY DEVICE IN OPERATION
GAS CONTROL LINKAGE GOVERNOR OPERATED

9—FUEL SWITCHER for use on dual-fuel diesel engines

Shutdowns occurring when depending on manual changeovers from one fuel to another are eliminated with this automatic fuel switcher, it is announced. The switcher is optional equipment for all of manufacturer's dual fuel diesel engines. With it, when gas pressure drops below normal or fails completely, the engine automatically changes over to 100 per cent fuel oil, says company. When operating on gas with pilot oil or 100 per cent oil, the switcher acts to place the engine under command of the governor with full travel at its best governing efficiency. Using full travel from no load to overloads steadies governor control of fuel metering equipment.

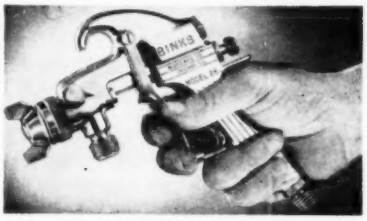
In operation, the engine is started and brought up to speed on oil fuel. The automatic fuel switcher is designed to act immediately when gas pressure in the main supply line drops below a predetermined minimum—usually 25 psi. It closes the gas metering valves and simultaneously shifts linkage that place the fuel pumps under control of the governor at the required setting for the load at that moment. Then, before manually changing over to gas, the automatic system is engaged so it will be ready to act in the event of a failure. When that happens, air pressure in the pneumatic cylinder is released and the plunger engages the changeover linkages. This closes the gas metering valves, opens the fuel pumps and transfers governor control to the fuel oil system. Worthington Corp.

10—GATE HOUSE can be shipped fully assembled

Every convenience needed for proper shelter of personnel is provided in this porcelain enameled steel building, manufacturer announces. It can be completely assembled at the factory and shipped by truck all ready to be placed on a foundation—or it can be factory-assembled in panel sections and shipped crated for erection on the site by plant maintenance crews.

The building measures about 4-by-11 ft and is designed to serve as a gate or guard house at industrial plant areas or as a yard office. Sidewalls are sandwich panels, insulated and finished on both sides, so the building is completed inside and outside as each panel goes into place. The roof is also insulated and provided with a porcelain enameled ceiling as an interior finish. Sliding aluminum sash on all sides gives light and ventilation, and a sliding metal door conserves space.

Interior lighting and wiring is furnished installed, and provision is made for fluorescent lighting in an exterior eave trough for roof top flood lights. The floor is finished with asphalt tile or linoleum, and electric outlets are provided for radiant heaters or fan. If shipped assembled, the structure can be placed on a foundation in approximately 3 hr. The Erie Enameling Co.



11—SPRAY GUN is a low priced and compact unit

The Model 26 weighs only 15 oz, has an aluminum body and a handle and trigger designed to fit even a small hand. According to manufacturer, the light weight and easy fit of this gun enables women operators to use it for long periods of time without muscular fatigue. It is stated, also, that the Model 26 produces high quality finishes because it uses nozzle set-ups similar to those furnished on the heavy-duty spray guns.

The Model 26 has a replaceable cartridge-type air valve, and a brass fluid passage to protect the body from corrosion and erosion by paints and other fluids. Air enters the Model 26 through an inlet at the bottom of the handle. This, says manufacturer, serves to distribute hose weight properly and facilitate manipulation. Intended for spraying lacquers, synthetic enamels, paints and other finishes or coatings of

...with TYCOL lubricants on hand!

Take metal fabrication, for example. There's a Tycol lubricant for any application you can name: For instance, what about tough machining jobs? . . . Tycol Afton cutting oil keeps cutting edges cool . . . lengthens tool life between grinds. Machine tool hydraulic systems? . . . Tycol Aturbrio oxidation and rust inhibited oils keep them running smoothly. Open gears of metal forming equipment? . . . Tycol Amaclac lubricants cling like cat hair on a serge suit. You always get top performance with Tycol lubricants. Why? . . . Because each Tycol grease and oil is manufactured from high quality base stocks and *tailored* for a specific application. Get the full story of the entire Tycol line from your local Tide Water Associated office today!

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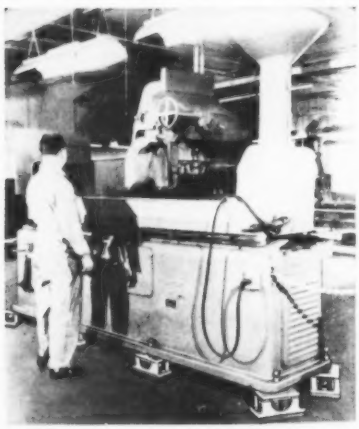
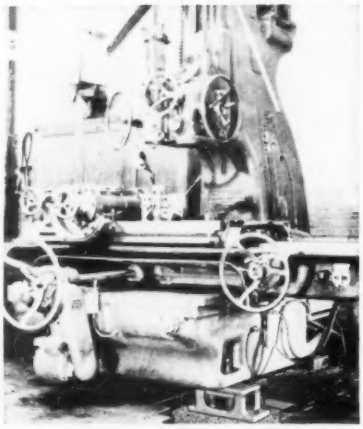
For more facts circle 573 on Reply Card

STOP VIBRATION
WITH
KORFUND VIBRATION CONTROL



This Thompson 12" x 60" Surface Grinder is installed at Firth Sterling, Inc., Pittsburgh, Pa. Vibration from grinders affected precision testing equipment on floor below; vibration and noise was also extremely annoying in executive, sales and laboratory offices. Korfund Isolators directly under the grinders, completely solved the problem. Korfund Units stop vibration and insure quieter machine operation.



This Pratt & Whitney 38 Jig Borer is installed at Caterpillar Tractor Co., Peoria, Illinois. Korfund Vibro-Isolators protect this precision machine against severe external vibration from trucks and trains which had made accurate work impossible. Isolators are set in pockets made by removing wood block flooring. Korfund Units stop vibration and reduce rejects—improve work quality.

This is one of the Heald 49 Bore-Matics installed at Thompson Products Co., Cleveland, Ohio. Shock transmitted from one automatic boring machine to another caused intermittent skips and gauges. One machine had to be kept idle until both were mounted on Korfund Isolators. Now they operate together and turn out perfect work. Korfund Units stop vibration and increase production.

Korfund Vibration Control also: permits more efficient plant layouts, decreases original building and foundation costs, permits installations without reinforcement of floors, reduces machine maintenance costs, and lengthens machine life.

Standard Korfund Isolators are available for most applications. A Selector Chart giving recommendations for both normal and critical conditions is available. See Sweet's Catalog Files or write us for Bulletin No. 5.

See us at
Booth 1001
at the Plant
Maintenance Show
Chicago
January 25-28

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-35R Thirty Second Place, Long Island City 1, N. Y.
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For more facts circle 574 on Reply Card

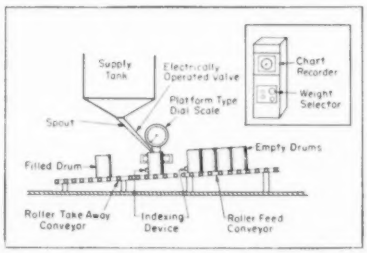
NEW PRODUCTS

(Begins on page 134)

light or medium viscosity, the Model 26 is also suggested for intermittent or production touch-up painting. It lists for less than $28.00 including precision nozzle set-up. Bulletin 26 describes this gun. Binks Mfg. Co.

12—WEIGHING SYSTEM to prevent overages, underages

Here's an automatic tare-weighing system designed to do away with even small overages and underages, and to permit finer process control in weighing and filling operations. In this system, a drum, can, cylinder or box is automatically tared and then filled with the product until a selected weight is reached. The weight of the product in the container is then recorded or



printed for permanent record. The system is declared suited for any liquid or solid product in any operation where quality control is desirable, and where savings of a few ounces or pounds can mount to considerable sums.

Containers may be fed to the weighing platform manually or by automatic indexing system. Automatic controls govern the weighing process, and taring is done by instruments fitted to the scale. According to manufacturer, the system is fast, and consistent and eliminates human error. The product is weighed in the shipping container and not in a weigh hopper where liquids, in particular, could cling to the walls. In effect, the container serves as the weigh hopper. Over-under control may be applied, if required.

Making up the taring system are the weighing platform, scale dial, console instrument panel, and the transducer mechanism mounted on the scale dial. The printer or recorder may be located on the console, at the weighing installation or elsewhere in the plant. The system has an automatic alarm system that shuts down the operation in whole or in part when anything goes wrong. Richardson Scale Co.

13—POWDERED FLUX for welding aluminum bronze

A powdered flux for welding company's Ampco 8 and other aluminum bronze sheet and plate has been developed for use with inert-gas processes and bare Ampco-Trode filler rods. Ampco-Weld flux removes oxides from weld metal and is reported to reduce

CUTS MACHINE DOWNTIME, CONSERVES TUBE DOLLARS!

NEW G-E INVENTORY CONTROL SYSTEM FOR ELECTRONIC TUBES!

A convenient metal box holds your file of tube life cards. These show actual performance by types and applications—are a valuable guide in obtaining more hours of service from tubes in your plant.

A handsome blue leatherette binder, gold-lettered, contains your inventory record by months... also lists prices, essential ratings, and many other tube facts.

GET FULL DETAILS FROM YOUR G-E TUBE DISTRIBUTOR!

YOUR best protection against electronic outages is to maintain a planned minimum tube inventory that meets, type by type, the important socket requirements of your plant. Now G.E. brings you practical help in matching your emergency needs for ignitrons, thyratrons, phototubes, and other types, with tubes on hand, ready to install.

The experience of many thousand users backs up this new inventory control system. In addition to recording your stock and order position, tube costs are listed, so that you may budget replacement expense. An interchangeability guide helps you make tube substitutions when necessary. Life cards tell the story of tube performance, and point out where improvement is desirable.

Your nearby G-E tube distributor is waiting to help you install this up-to-the-minute control system. Phone him today! *Tube Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

161-1B1

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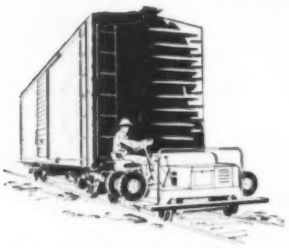
MOVE RAILWAY CARS quickly, easily... at low cost!



Moves Box Cars, Tank Cars, Gondolas Flat and Hopper Cars!

Get fast, flexible lower cost car moving with the Whiting Trackmobile! It's always ready for spotting, switching or hauling. It travels on road or track, changes from one to the other in half a minute, moves from job to job without delay. The Trackmobile requires only one operator, handles easily with automotive type controls, and employs a special hydraulic jacking action on the mated couplers to develop a maximum draw-bar pull of 8400 pounds! It frees larger locomotives for other tasks, helps reduce work crew waiting time, cuts demurrage and outside switching costs . . . keeps cars, materials and men on the move! Get complete information today!

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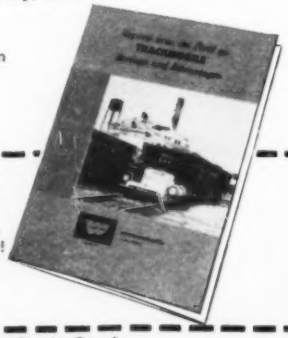
Other Whiting Equipment to Speed Handling—Overhead Cranes, Trambeam Overhead Handling Systems, Electric Chain Hoists.



PROVED ON THE JOB! "Reports From the Field on Trackmobile Savings and Advantages" shows actual Trackmobile dollar benefits . . . ask for your copy today!

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NEW PRODUCTS

(Begins on page 134)

surface tension, allowing deposit to flow into the side walls uniformly, and producing a sound deposit of improved appearance. Full penetration can be secured in straight butt joints at lower welding currents and preheats, it is claimed. This flux may be mixed with alcohol and painted on all surfaces of the joint to be welded, or applied to the bare filler rod. It may be used for joining silicon or tin bronzes and brasses. Ampco Metal, Inc.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

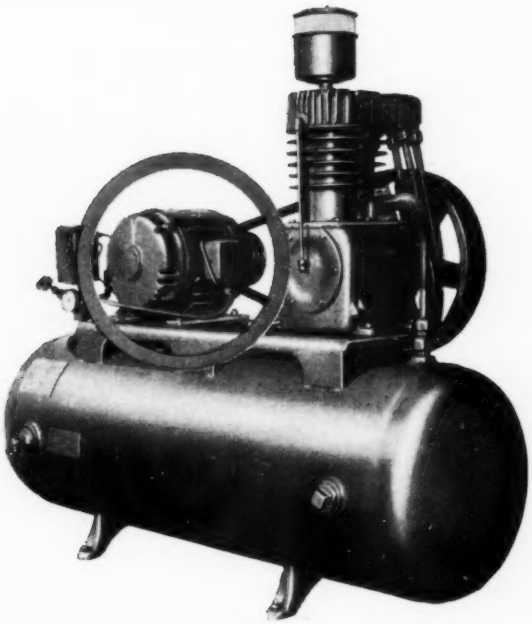
14—HAND CLEANER offers antiseptic properties, too

Antiseptic Waterless Sulpho Hand Cleaner is formulated not only for on-the-job hand cleaning, but also for the protection of persons with naturally dry or sensitive skins—and who may be allergic to the excessive use of many soaps or cleaners containing petroleum solvents. Sulpho is said to be the first product of its type with built-in antiseptic (2 per cent hexachlorophene).

It is pointed out that harsh skin cleansers are the cause of many cases of industrial dermatitis. This cleaner is made of sulphonated vegetable oils which are often used in the treatment of industrial dermatitis, says manufacturer, and sulphonation converts oils into emulsifying agents able to remove dirt and grease from the skin. This new hand cleaner also contains a relatively high amount of unsulphonated vegetable oil which is said to act as an emollient and keep the skin from becoming defatted. West Disinfecting Co.

15—TUBE CHECKER for testing, trouble shooting

A proportional mutual conductance type tubechecker, Model 981 Type 2, is said to permit faster and more accurate testing of all tube types. It is designed to provide for rapid measurement of proportional mutual conductances, emission characteristics of rectifiers and diodes, and firing potential limits of voltage regulators and low power thyratrons. A special feature is provision for accurate meter measurement of leakage resistance as high as 5 megohms, between the tube elements. The checker also measures transconductance up to 24,000 micromhos, a selector switch providing ranges of 3000/6000/12000/24000 micromhos. Multiple switching permits any combination of tube connections to be made and it is noted three toggle switches allow quick checking and comparing of the respective sections of



Buy with confidence any machine

POWERED BY LELAND!

THE LELAND MOTOR supplied as original equipment on the machine or equipment you buy is your assurance that the manufacturer has not compromised with quality for the sake of cost. For Leland builds only *quality* motors...works hand-in-hand with manufacturers to provide standard or specially designed motors ideally suited to the specific application. The fact that the manufacturer has spared no expense to assure a dependable source of ample, smooth, quiet power for his product may well reflect a generally high degree of care and quality throughout.

Leland Type PA Polyphase Induction General Purpose Motor provides high starting torque for compressors and similar applications from 1/6 to 5 H.P.

The LELAND ELECTRIC Co.

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products are better...by design

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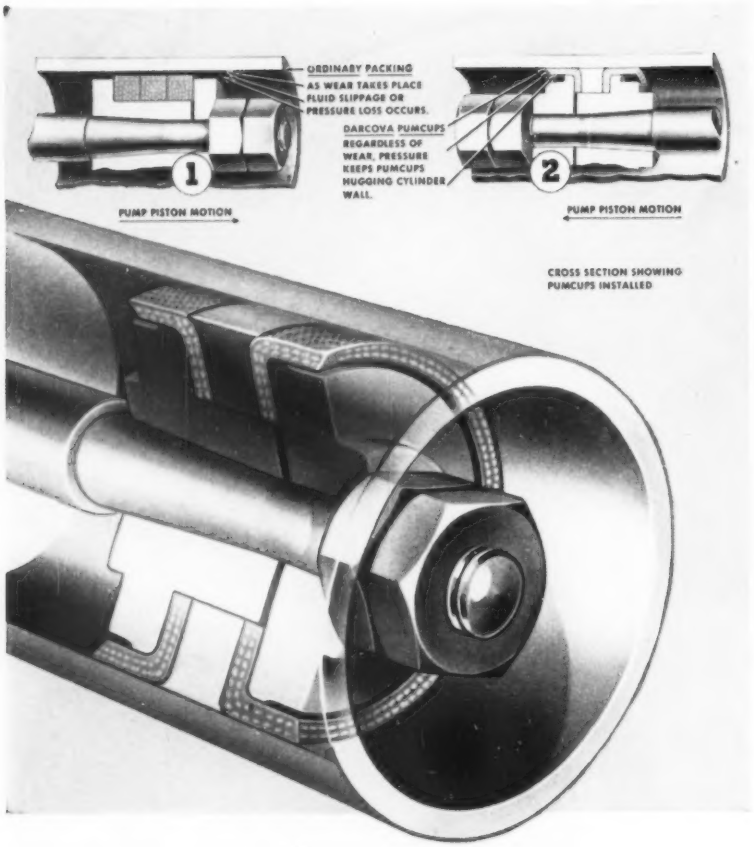


DARCOVA PUMCUPS mean EFFICIENCY to cost-minded engineers!

IN air and hydraulic cylinders and reciprocating pumps Darcova Pumcups actually retain full efficiency *throughout* their life span . . . and they outlast most other packings at least 3 to 1!

Special texture engineering plus the Darcova Pumcup principle makes it possible for Pumcups to hold their peak volumetric efficiency. Moreover, Pumcups permit equipment to be operated at reduced speeds, save power, prolong equipment life and eliminate the need for frequent replacement shutdowns.

For less maintenance and lower operating costs find out more about Darcova Pumcups. Write for Bulletin No. 4502 on Pumcups for air or hydraulic mechanisms, Bulletin No. 4401 on Pumcups for reciprocating pumps.

DARLING VALVE & MANUFACTURING CO.

Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
PUMCUPS

For more facts circle 578 on Reply Card

NEW PRODUCTS

(Begins on page 134)

twin-section tubes at only one setting of the selector switch. One socket is used for each tube base. There are 19 filament voltage settings from 0.65 to 115 v and five plate voltages from 20 to 177 v with a 45-v source to facilitate testing of sub-miniature type tubes. Weston Electrical Instrument Corp.

16—WALL RACK for coats, hats; of welded steel

Four sizes of Office Valet Wall Racks for coats and hats are offered in packaged units. The rack is mounted directly on the wall and can be positioned at various heights from the floor. It provides three spaced coat hangers and three individual hat spaces per running foot of length. Constructed of welded square tubular furniture steel, perforated and embossed shelves, the rack is designed for long service under severe usage. Vogel-Peterson Co.

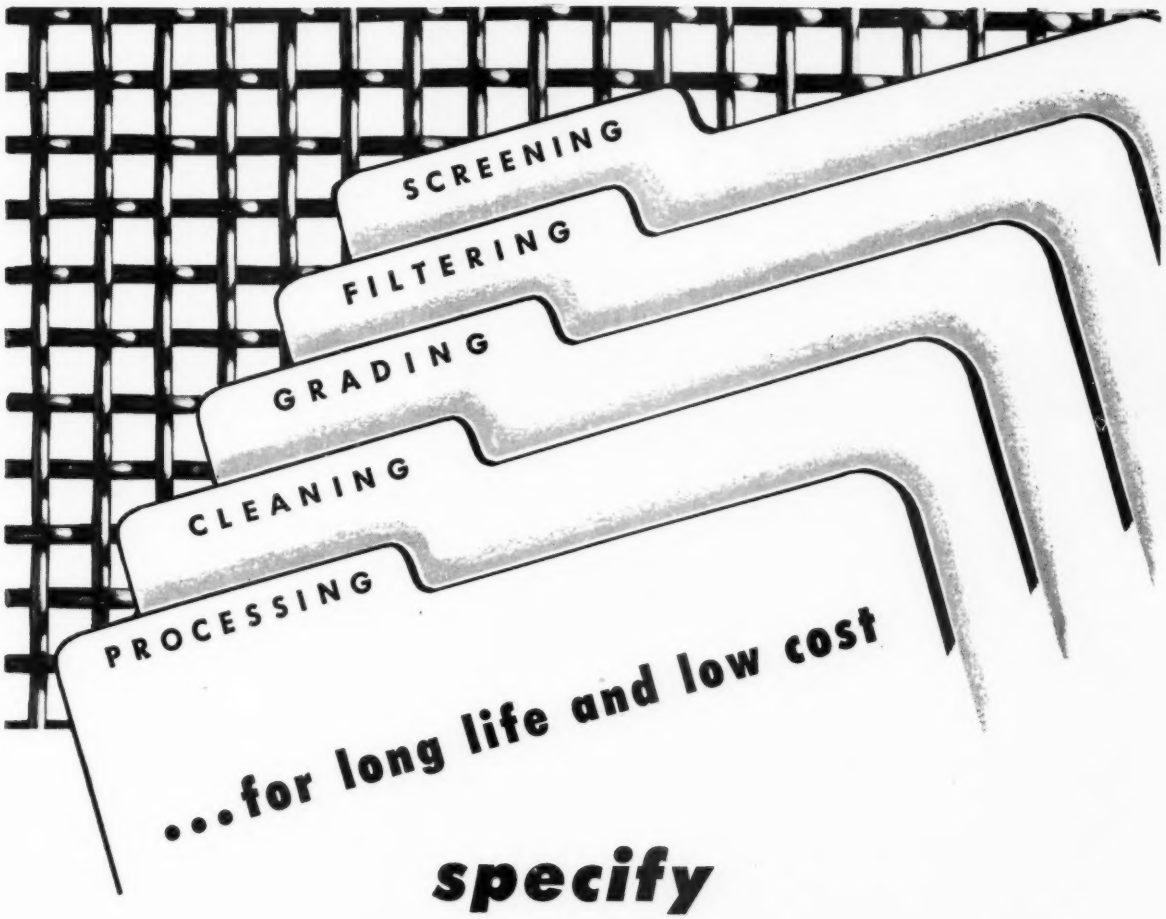
17—PRINTING CALCULATOR speeds plant arithmetic

Higher standards of operator efficiency are claimed possible with the introduction of the Model 99 Automatic Printing Calculator. Its ten-key, touch method keyboard activates a high-speed mechanism which automatically calculates, proves and prints on tape problems involving fully automatic multiplication, division, addition or subtraction. Invoices and sales figures, payrolls, inventories and statistical reports are only a few of the accounting jobs handled by this machine, it is claimed.

Contributing to the Model 99's efficiency are such newly-engineered features as Simpla-Tape, automatic clearance, constant multiplication and total control. Simpla-Tape shows only the essential figures of each problem. It is

designed to eliminate superfluous steps, facilitate operator checks and increase readability of the tape for record purposes. Individual factors are easily distinguishable, while subtotals and totals are automatically printed in red.

The calculator is designed to clear automatically at the end of each problem, and the total or asterisk on the tape also indicates that the machine is ready for the next problem. Despite the



specify

CAL-WIC MESH CLOTH

You'll find CAL-WIC Mesh Cloth available in a wide variety of weaves, weights and meshes . . . fabricated in various types of metals and alloys for resistance to corrosion, abrasion, or high temperatures.

For original equipment or replacement, investigate the advantage of "precision-made" CAL-WIC Mesh Cloth. Write for further information.

THE COLORADO FUEL AND IRON CORPORATION — Denver and Oakland
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CAL-WIC
INDUSTRIAL SCREENS
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Lick Leaks
with DART Drop-Tight Unions

This True Ball Joint Makes the Difference

QUICK FACTS

- Leakproof because precision-machined to a true ball joint and spherically ground
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- Nut and Body Practically Indestructible (They are of air-refined, high test malleable iron)

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NEW PRODUCTS

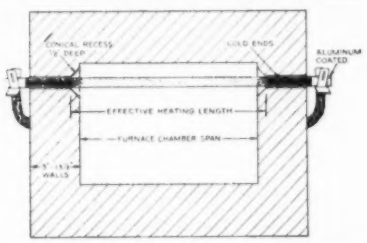
(Begins on page 134)

fact that the machine clears itself automatically, it can retain a multiplicand indefinitely, if desired, company explains. This is of value where the same number must be multiplied by a series of other factors for separate totals.

The total control feature facilitates accumulative multiplication. Here, multiplicands differ and individual totals are not desired. A flick of the total control lever can hold the individual totals until the final listing. Accumulated within the machine, they then appear as a grand total, printed in red. The Model 99 is "cushioned powered" and weighs only 39 lb. Descriptive literature on its construction and operation is offered. Remington Rand Inc.

18—HEATING ELEMENTS for many industrial uses

Hot Rod Crystolon Heating Elements are said to provide a clean, easily controlled and noiseless source of heat for use in ceramic kilns, heat treating, melting and sintering furnaces. These non-metallic elements were originally designed for the manufacturer's own use in electrically-fired tunnel kilns,



which required heating elements combining long life with a slow resistance rise under continuous service. These elements are reported to have a service life of up to 18 months under continuous operating conditions.

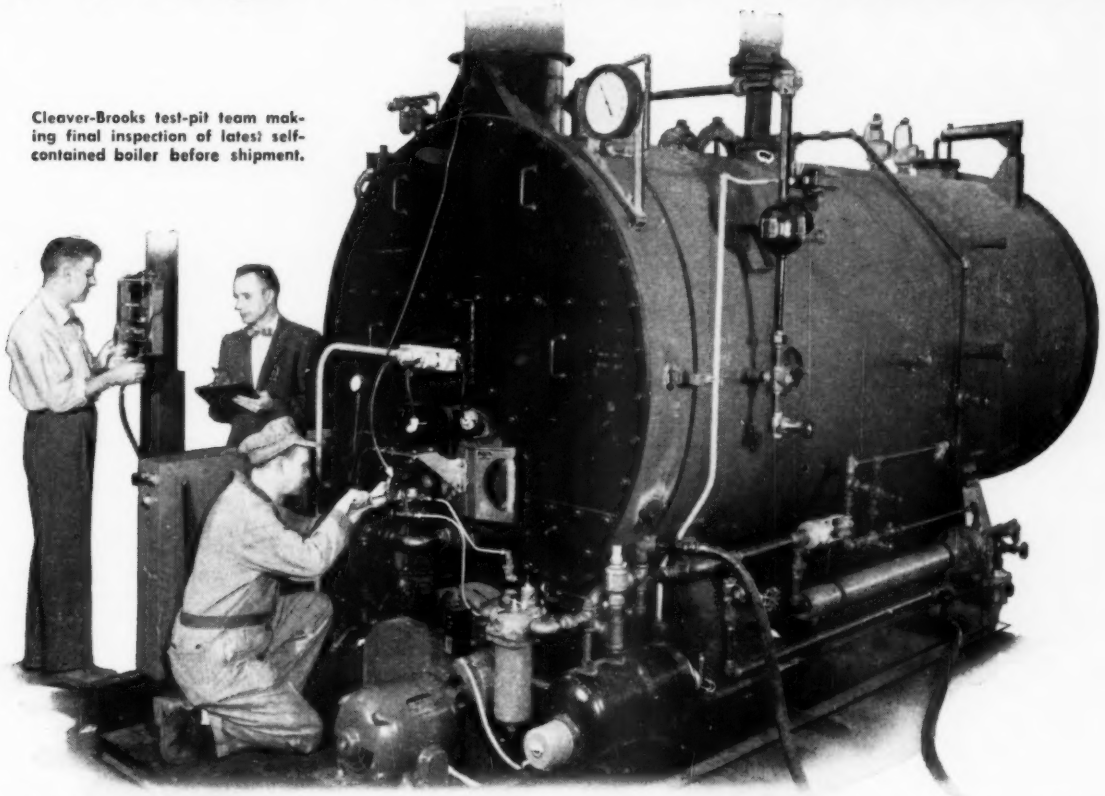
Success of these elements in this application has led to their production for general industrial use—expected to be underway early this year. An instruction manual available covers operating temperatures (up to 2800 F), mounting methods and electrical data. Norton Co.

19—ELECTRONIC PHONE is designed to lick noise

For noise-free communication in noisy areas, the Gai-Phone (pronounced "guy phone") is designed to let the user carry on a clear conversation without leaving his desk or post. It requires no acoustical booth or other enclosure. The Gai-Phone is similar in appearance and operation to a conventional telephone, says manufacturer, and it can be installed and mixed with conventional telephones in the same system. And because its maximum output is no greater than that of a conventional telephone, it can be used wherever such a telephone would be used, it is explained.

Use of a special close-talking, dynamic transmitter in the Gai-Phone

their counterpart "Test-Pilots" have at Cleaver-Brooks



Cleaver-Brooks test-pit team making final inspection of latest self-contained boiler before shipment.

HIGH SCORES . . . on factory and on-job tests guarantee greatest return from boiler investment

When test pilots give the familiar "O.K." — that's the sign of proven performance. It's the same with boilers in the Cleaver-Brooks plant. Only after accurate, thorough inspection and testing under actual operating conditions do boilers get the final "O.K." from experienced test engineers. That's why you get guaranteed 80% efficiency from your Cleaver-Brooks boiler when firing with oil.

A record of this test is available to every buyer on request. In fact, you as a buyer, consultant, or contractor are invited to witness the actual test on your Cleaver-Brooks boiler before shipment.

And further, Cleaver-Brooks boilers are placed in operation at the job site by factory service engineers who check installation, train your operators and make complete and detailed field tests.

So, when you buy a boiler, insist on factory tests as well as field service tests by qualified engineers. There is no better way of insuring yourself of the very best value money can buy and the greatest return from your boiler investment. Look to Cleaver-Brooks, the leader in the "Packaged" Boiler field for two decades. Write today for latest Catalog AD-100.

Available for oil, gas and combination oil/gas firing.

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Cleaver-Brooks
Originators of the Self-Contained Boiler

BOILERS — STEAM OR HOT WATER — FOR HEATING AND PROCESSING IN SIZES FROM 15 TO 500 HP, 15 TO 250 PSI

For more facts circle 581 on Reply Card

The All New MOBILIFT 4000 Pounder

Has Everything You Want in a "Sit-Down" FORK LIFT TRUCK

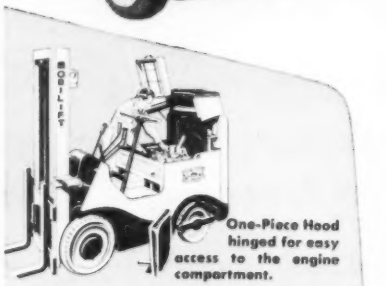
Model D-424
4,000 lbs. capacity
at 24" load center
83" hydraulic mast
lift height 108"

Here are Just a Few of the Trend-Setting Features...

- **Chrysler 65-bhp 6-cyl. Gas Engine**
- **Chrysler Gyrol Fluid Coupling**
- **Mobil-Matic Drive** for smooth, positive power transmission through the MOBILIFT Oil-Immersed, Multiple-Disc Clutch and **Constant-Mesh Transmission**—Two speeds forward, two reverse.
- **One Lev-R-Matic Control** for forward and reverse...just *Push* to go forward—*Pull* for reverse—NO CLUTCH PEDAL—NO GEARS TO SHIFT!
- **MOBILIFT Full-Floating Drive Axle.**
- **Hydraulic Service Brakes.**
- **Combination Ball-Bearing Worm & Nut Type Steering.**
- **Easy to Get On and Off**—no obstructions. Free access from left or right side.
- **One-Piece Hood Raises for Easy Service Accessibility.**

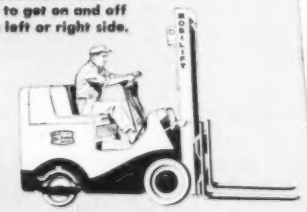
These—and many more—exclusive MOBILIFT features makes this new D-424 the lift truck for you!

Write today for complete details.



One-Piece Hood hinged for easy access to the engine compartment.

NO OBSTRUCTIONS—Easy to get on and off from left or right side.



LAMSON MOBILIFT CORPORATION
835 S. E. MAIN STREET, PORTLAND 14, OREGON
2317 W. 18TH, CHICAGO · 790 PATTERSON AVE., E. RUTHERFORD, N. J.
2724 TAYLOR STREET, DALLAS · 2730 SAN PABLO AVENUE, BERKELEY
1113 SPRING STREET, N. W., ATLANTA

For more facts circle 582 on Reply Card

NEW PRODUCTS

(Begins on page 134)

handset is said to result in both clear transmission of the user's voice and clear reception under noisy conditions. The phone is said to control both incoming volume level and outgoing level; thus it can be adjusted for best operation in individual locations. Another feature claimed for the Gai-Phone is controlled automatic elimination of "side tone," advantageous in noisy spots because it reduces to below audibility the amount of noise picked up on the transmitter and fed to the receiver in the same handset. Gai-Tronics Corp.

20—FLUORESCENT LIGHT offers full color rendition

The Super Delux 45 is announced as a new dimension in fluorescent color incorporating a neutral light source in the upper limit of the visible wave length region, producing true color rendition throughout the visible spectrum. It is said to mark an important advance in fluorescent lighting because it does not distort colors from which it is reflected—even being flattering to complexions. The lamp is now being produced in regular fluorescent sizes. Duro-Test Corp.

21—ROLLER TOP TRAILER with two conveyor sections

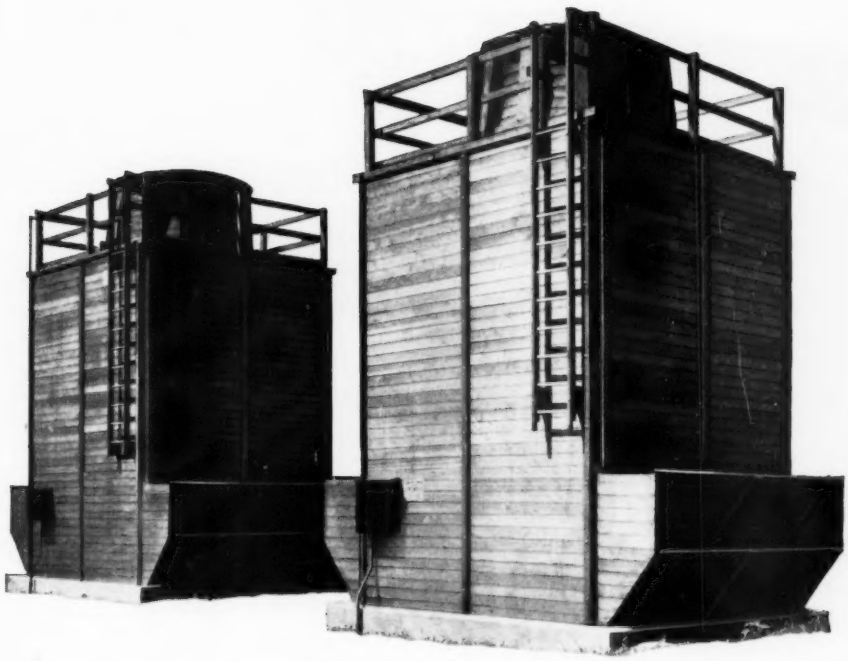
A 3000-lb capacity roller top, caster steer trailer, Type A-308-78M, features two roller conveyor sections 30 in. above floor level. Designed to fit into standard conveyor lines, it permits pick-up and transfer of packaged units. The live deck is made up of two six-roller sections. Thirty-in. rollers have 1.9 in. diameters, and platforms are 49 by 72 in. The unit rolls on rubber tired

wheels—8 by 2½ in. on front, 10 by 3 in. on rear. Trailer is equipped with company's safety self couplers.

Cartons or cases coming down conveyor lines automatically load themselves on trailer by riding over the rollers, company explains; they are locked in proper position when roller brakes are applied. The trailer takes two packaged units. Mercury Mfg. Co.

22—BELTING designed for heat, abrasion resistance

Special wire reinforcing for maximum resistance to abrasion and impact is a feature of Sahara Armored Belting, designed for long service in handling hot materials. Two types are available: Insulated, for materials of 300 to 450 F,



MORE EFFICIENCY MEANS MORE POWER

Improved efficiency in every detail of the operation of power generating facilities is one answer to the ever-increasing demands for more power.

That's why leaders in the power field choose Pritchard cooling towers. They know that Pritchard heavy-duty towers—like these shown here built for the diesel power plant in Nebraska City, Nebraska—are designed *right* . . . engineered with adequate capacity . . . to do any required cooling job at minimum operating expense. Consult Pritchard—a founder member of the Cooling Tower Institute—to be sure you get *guaranteed performance . . . maximum efficiency* . . . from your next cooling tower.

Pritchard QUINTAIR* Air-Cooled Heat Exchangers

For more efficient . . . more dependable . . . cooling or condensing of liquids, gases or vapors, specify a Pritchard QUINTAIR* air-cooled heat exchanger. Quality construction assures long, trouble-free service . . . skillful design makes all parts that may require attention readily accessible for easy maintenance.

Registered Trade Name

Industry's Partner for Progress

Cooling Towers
Specialized Heat Exchangers
Gas and Air Treating Equipment
Construction and Processing Facilities

J.F. Pritchard & Co.

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CHICAGO • HOUSTON • NEW YORK • PITTSBURGH
ST. LOUIS • TULSA

Representatives in Principal Cities from Coast to Coast

For more facts circle 583 on Reply Card

SPLASHED WITH OIL . . .

ALGRIP
still remains Non-Slip!

It occurs every day. ALGRIP Abrasive Rolled Steel Floor Plate is installed—then insurance premiums tumble—slipping accidents stop.

The reason is tough steel floor plate *impregnated uniformly* with abrasive "grinding wheel" grain. Result: A truly non-skid surface that *stays* slip-proof, because wear only exposes new particles . . . a "safety extra" offered only by ALGRIP.

If your accident insurance premiums are too high, let ALGRIP bring them down. Mail this coupon today for the complete ALGRIP story. There's no cost or obligation.

Underwriters' Laboratories approved for safety. Note depth and uniformity of abrasive grain.

A.W. ALGRIP Abrasive Rolled Steel Floor Plate

ALAN WOOD STEEL COMPANY
CONSHOHOCKEN, PA.

Please send Booklet AL-5 on how ALGRIP can cut costs and accidents:

NAME_____ TITLE_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

For more facts circle 584 on Reply Card

NEW PRODUCTS

(Begins on page 134)

and Super Insulated for 450 to 600 F.

In these belts, wire is spun together with asbestos fibers in the outer ply. This reinforcement, combined with a surface hardening treatment, is intended to give greater strength and resistance to impact damage as well as to sharp cutting edges that tear and scrape belt surfaces. The core is heavy, tight-woven silver duck with tensile strength of over 750 lb per in. of width, company says, and inner-locked stitches prevent ply separation. These belts are declared particularly suited to carrying hot foundry castings and shakeout sand. Imperial Belting Co.

23—BRAKING DEVICE for use on fork trucks

Designed to promote both safety and economy, this automatic braking feature is now available as optional equipment at slight additional cost on this company's gasoline and diesel fork trucks. It is so designed that when the operator leaves his truck, the driver's seat rises instantly, causing the parking brake to be applied. In addition, a time delay permits the engine to idle for 3 min before automatically shutting it off. This idling feature gives the operator time to make minor fork adjustments or to perform other activities and return to the seat without having to restart the engine.

An important safety factor exists because the brake is applied automatically to an unattended vehicle, it is pointed out, and engine life is increased because long idling periods are eliminated. The Yale & Towne Mfg. Co.

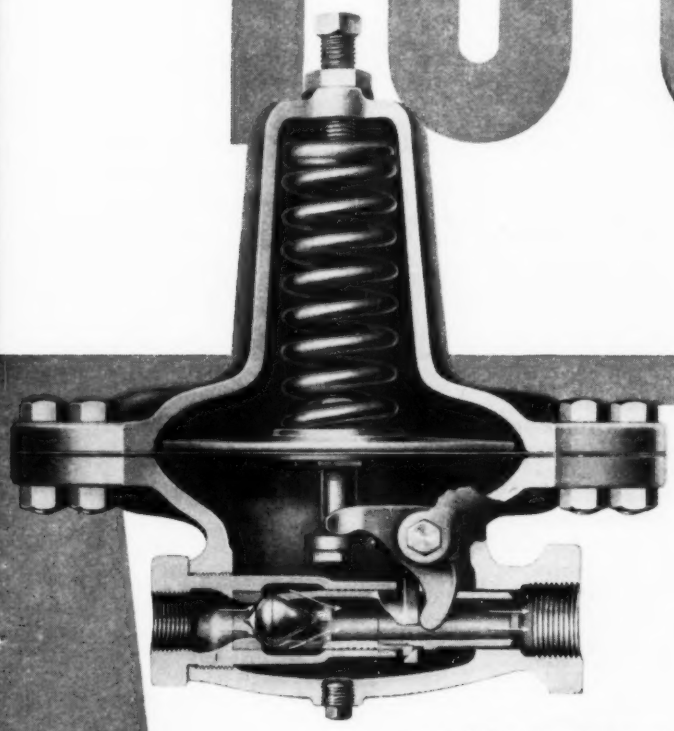
To receive product data circle item numbers on the handy Reader Service Cards on pages 37-38 and 185-186.

24—HYDRAULIC FLUID is efficient and fire resistant

Houghto-Safe, a non-flammable hydraulic fluid, is also claimed to offer top hydraulic efficiency. According to manufacturer, it satisfies the need for a safe, non-toxic, non-corrosive liquid that can be used in hydraulic equipment operated near open flames or adjacent to extreme heat conditions. It is described as a water-base, "snuffer-type" material, rated as an acceptable hydraulic fluid from the fire hazard standpoint by Associated Mutual Fire Insurance Companies.

Hydraulic pump tests are reported to show that Houghto-Safe has the lubricating ability of high grade petroleum hydraulic oils. Other advantages announced include high oxidation stability and a viscosity index of 150. Company says it will not freeze, is pumpable at

TYPE 1000 VALVE



Any product of quality should be dependable when *ordinary* products fail. Sudden pressure fluctuations, dirt, scale and viscous matter prove "fatal" to ordinary pressure reducing valves.

The CASH STANDARD TYPE 1000 VALVE however, is designed to operate with complete dependability under the most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

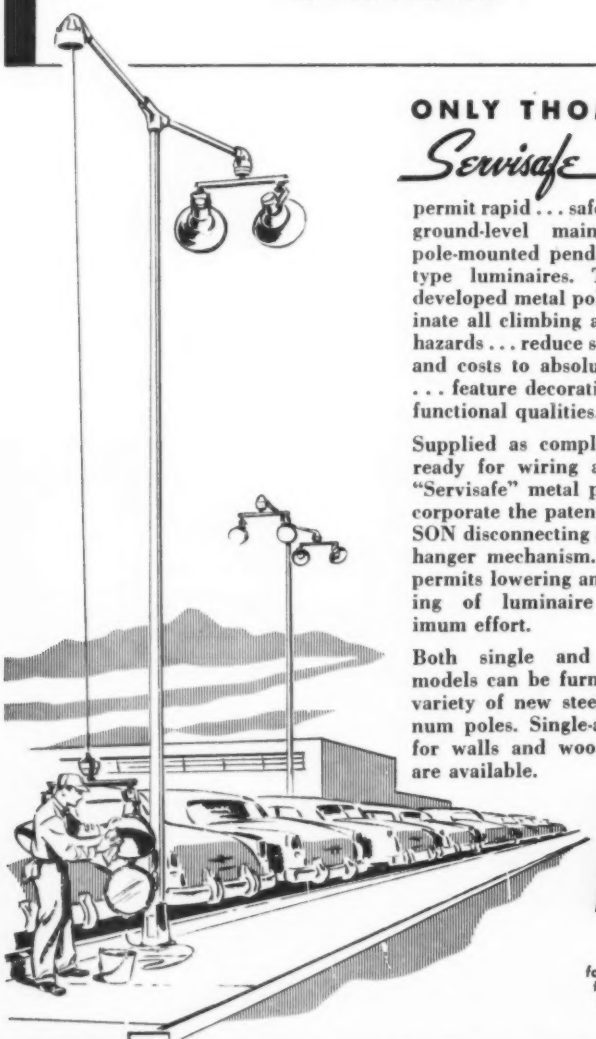
Truly an *EXTRAORDINARY* achievement of quality and design excellence.

INSTALL CASH STANDARD "TYPE 1000" VALVES

CASH STANDARD **DECATUR, ILLINOIS**

A. W. CASH COMPANY

NEW METAL POLE UNITS PROVIDE GREATER ECONOMY, EFFICIENCY AND SAFETY FOR OUTDOOR LIGHTING SYSTEMS



ONLY THOMPSON *Servisafe* UNITS

permit rapid . . . safe . . . efficient ground-level maintenance for pole-mounted pendant or flood-type luminaires. These newly developed metal pole units eliminate all climbing and electrical hazards . . . reduce servicing time and costs to absolute minimum . . . feature decorative as well as functional qualities.

Supplied as complete packages ready for wiring and erecting, "Servisafe" metal pole units incorporate the patented THOMPSON disconnecting and lowering hanger mechanism. This device permits lowering and repositioning of luminaire with minimum effort.

Both single and double-arm models can be furnished with a variety of new steel and aluminum poles. Single-arm brackets for walls and wood poles also are available.

Write Today for Catalog PB-53 for Details and Specifications.

1754-TE

THE THOMPSON ELECTRIC CO.

1165 POWER AVENUE • CLEVELAND 14, OHIO

For more facts circle 586 on Reply Card

NEW PRODUCTS

(Begins on page 134)

0 F, and can be used at 1000 psi pump pressure. Amber colored and oily in nature, Houghto-Safe is further reported to carry 2½ times the load of many hydraulic fluids of similar viscosity and not to separate or break down under increased pressures. E. F. Houghton & Co.

25—STEEL CASTERS with oversize parts for strength

"Super-forged" Steel Casters, which have top and bottom plates of forged steel with all parts over-size, are available in 5-, 6- and 8-in. wheel sizes. They have either molded-on rubber tired, roller bearing wheels, or malleable iron machined face roller bearing wheels with solid roller bearings for greater capacity. Swivel fork and wheel are both equipped with screw type Alemite lubrication fittings. The caster load is a self-contained bearing with hardened and ground raceways. The thrust bearing is of the tapered type, and is held in place by an adjustable lock nut. Matching rigid casters are available for all wheel sizes. Thomas Truck and Caster Co.

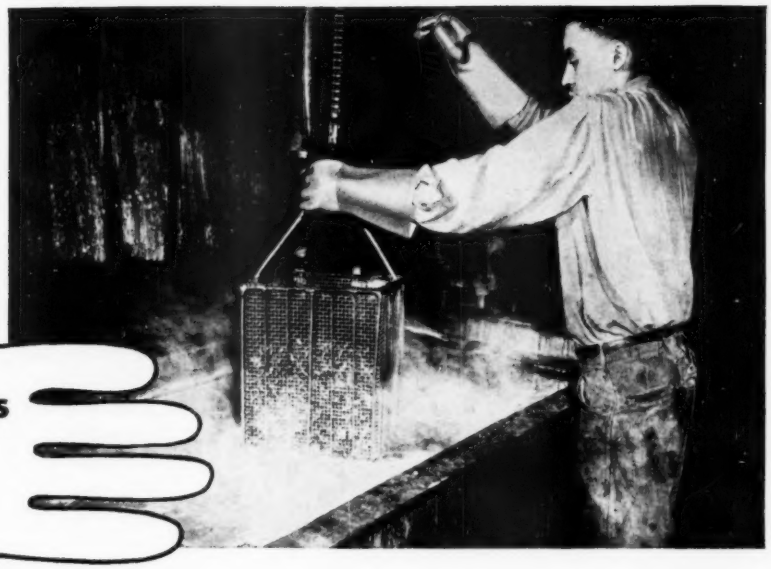
26—METAL WORKING UNIT for general maintenance

The Pullmax Model P-5 is a sheet and plate working machine offered for general maintenance department work where sheet metal must be cut to many sizes and shapes, and formed by beading, folding, dishing or louvering. It

works mild steel up to 7/32 in. capacity, and has a throat depth of 42 in. Adjustable centers permit cutting various size circles, while an adjustable guide aids in making straight cuts or square holes. Because of its movable upper tool, this will cut inside or outside work, manufacturer explains, and it does this by a reciprocating action that leaves an edge requiring no more finishing. American Pullmax Co., Inc.

27—MASONRY PAINT guards against moisture seepage

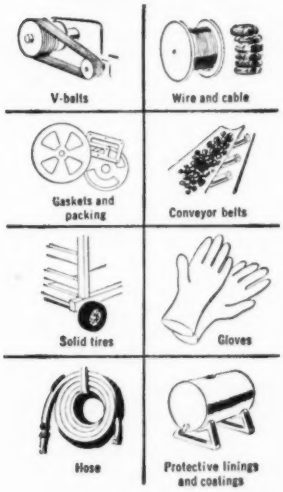
Formulated with Goodyear's Pliolite S-5 to withstand chemical attack from alkali and lime, this paint is said to be



BETTER RUBBER PRODUCTS ARE MADE WITH DU PONT NEOPRENE

Neoprene gloves protect against acid burns and cuts . . . save 6¢ per man-hour in plating firm

SPECIFY NEOPRENE IN THESE PRODUCTS:



Sharp metal parts kept snagging the expensive heavy-gauge rubber gloves used in a midwestern plating company. Workmen's hands were exposed to acids and solvents . . . cuts and burns boosted the plant's injury rate. Finally, various types of gloves were job-tested over a 90-day period. One type proved ideal in every way—a gauntlet-style fabric glove coated with a special neoprene compound.

The neoprene-coated gloves gave maximum protection against snagging and the action of corrosive chemicals. They resisted deterioration and abrasion . . . provided safer, surer handling on the job. Soon there was less time lost through accidents and higher employee morale. And management was able to save 6¢ per man-hour on glove replacements, thanks to the durability of the new gloves.

By turning in top performances such as this, neoprene products are cutting maintenance costs throughout industry. While Du Pont makes no finished goods of neoprene, your manufacturer or distributor will be glad to tell you about the neoprene products he supplies.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

NEOPRENE

The Rubber Made by Du Pont Since 1932

MAIL THIS COUPON TODAY

FREE! THE NEOPRENE NOTEBOOK—Every issue describes new products, unusual applications of neoprene . . . shows how neoprene cuts maintenance costs. Clip and mail this coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division PL-1, Wilmington 98, Delaware.

Name_____ Position_____

Firm_____

Address_____

City_____ State_____

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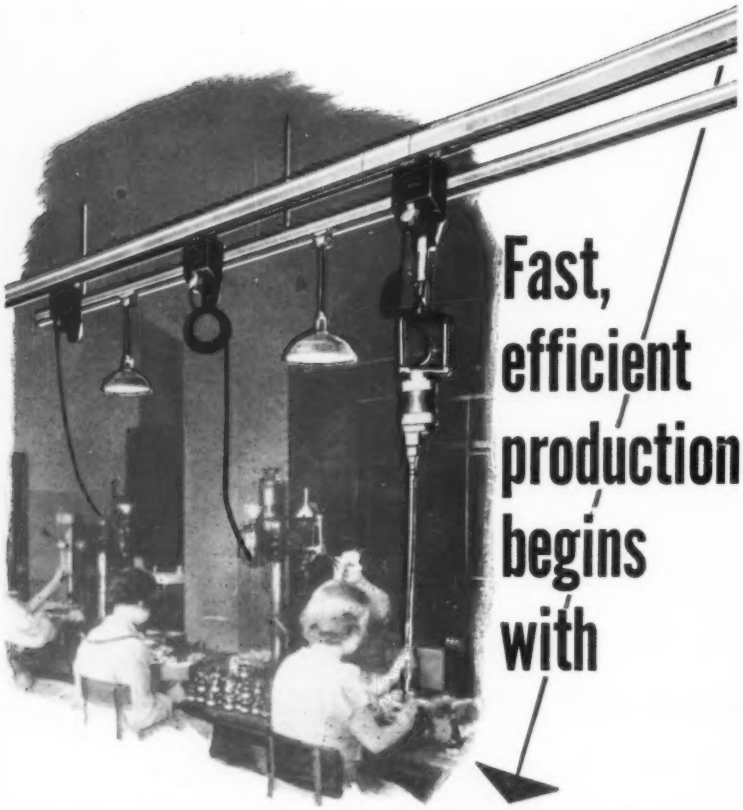

Fast, efficient production begins with

ELECTRIC FEEDRAIL®

That's because FEEDRAIL Trolley Busways over your production, assembly and test lines . . .

- provide mobile outlets for electrical machines and portable tools where they're wanted.
- eliminate long, dragging cables that endanger personnel and hamper their work.
- keep electrification and tools off floor and benches . . . away from the danger zone.
- enable quick tool changes without cutting off power.

Safe, smooth-flowing, time-saving production is the result — *a result you can get in your plant.* FEEDRAIL Trolley Busways are surprisingly easy to install in operating plants as well as new ones. And they're just as readily modified or moved to meet changing production requirements.

When you install FEEDRAIL Trolley Busways you're sure of maximum safety, adaptability and reliability in electrical power distribution.

THE FACTS ARE CONVINCING

Get them all in our new descriptive bulletin. Write for a copy to Dept. P-1.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST

54-2

ELECTRIC FEEDRAIL

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

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SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

For more facts circle 588 on Reply Card

NEW PRODUCTS

(Begins on page 134)

extremely effective against moisture seepage. It can be used on cement, asbestos shingles, stucco, brick, concrete.

Available in nine colors, it produces a non-lustrous finish that manufacturer claims resists staining, streaking and mildew. The paint is said to lock out water from the pores in the material to which it is applied, yet permit surface to breathe, expanding with the surface covered without cracking or chipping. F. O. Pierce Co.

28—WIRE STRIPPER with interchangeable cutters

Interchangeable cutters for stripping 12- to 24-gage solid or stranded wire, or 300 ohm twin lead-in wire are a feature of the Whiz Wire Stripper. It weighs only 12 oz and has a lock-open feature that holds the jaws open automatically so that the wire can be removed after stripping without crushing. The jaws

are released instantly with a finger tip touch of the lower handle, it is said, making it unnecessary to shift the grip on the tool while resetting. This feature suggests its use as a production line tool as well as for general shop use.

The tool has hardened steel cutters that are replaced by removing two screws. Four extrusions, two for each blade, hold them in alignment. The Whiz Wire Stripper has a rust-resistant black oxide finish, sells for less than $4.00. Extra blades cost 75 cents per pair. Rockford Wire Stripper Co.

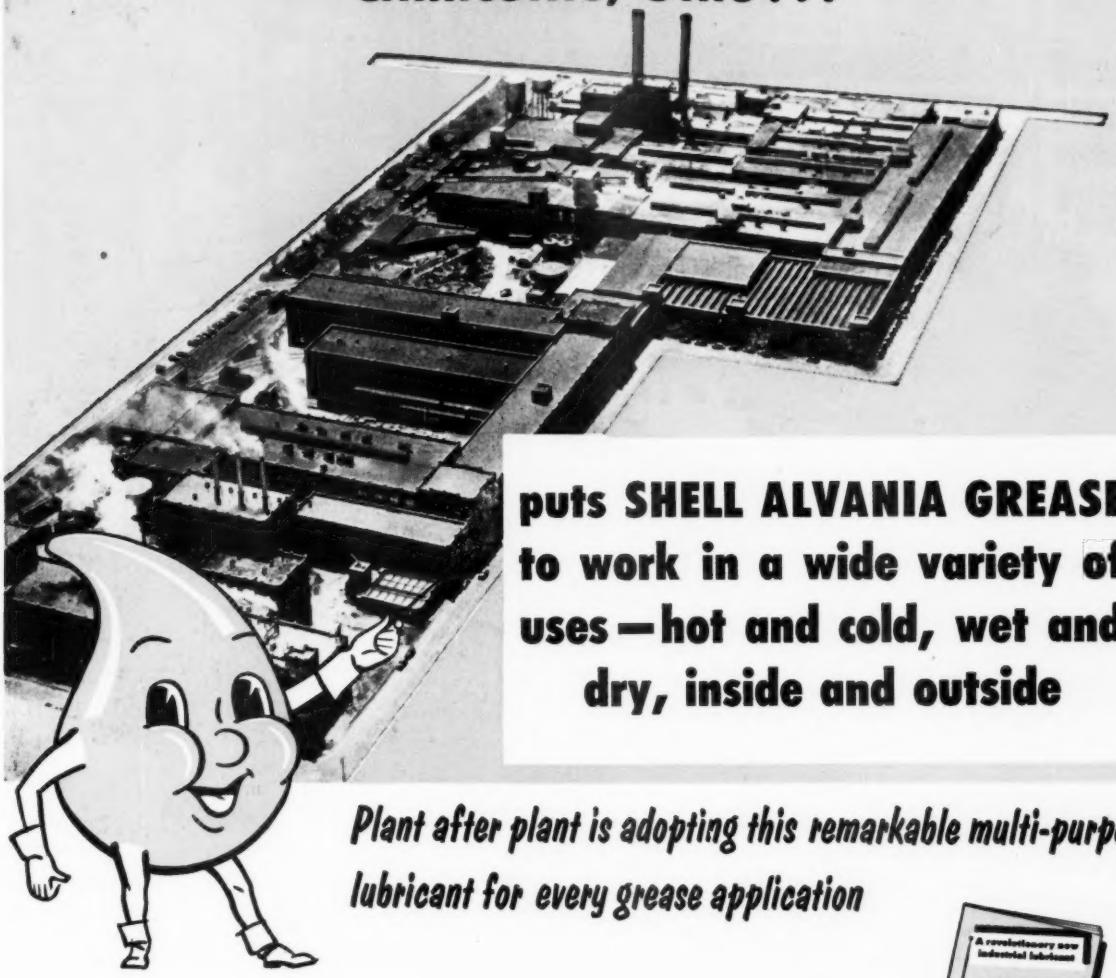
29—FORK TRUCK, side loading, 30,000-lb capacity

A 30,000-lb capacity model has been added to this company's line of Traveloaders—combination side-loading fork truck and load carriers designed to stack or haul long, bulky loads in a 12-ft aisle. Because it picks up loads from the side and hauls them length wise within the width of the unit and stacks them parallel to aisles, the Traveloader operates in less aisle-width than many types of fork lifts. One man controls the entire operation from his driving position, and hydraulic steering is provided.

The new 30,000-lb capacity Traveloader has a maximum travel speed of 30 mph, a lifting height of 12 ft. It is 300 in. long, 108 in. wide, and 120 in. high. The Baker-Raulang Co.

(More New Products on page 160)

THE MEAD CORPORATION,
Chillicothe, Ohio . . .



puts SHELL ALVANIA GREASE to work in a wide variety of uses—hot and cold, wet and dry, inside and outside

Plant after plant is adopting this remarkable multi-purpose lubricant for every grease application

LOOK AT THESE ADVANTAGES:

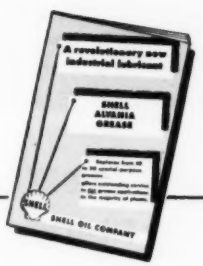
1. Shell Alvania Grease flows *freely* in cold temperatures, yet will not run out of bearings under excessive heat.

2. Ideal for wet, humid applications . . . it has high resistance to water emulsification.

3. Shell Alvania Grease has extremely high oxidation stability in service or storage.

4. You'll find that Shell Alvania Grease extends time between greasings . . . a substantial saving in labor and grease.

5. Simple inventory . . . just the one grease to stock and apply.



There is decided economy in handling just one grease *instead* of many different types. Write for the new booklet on Shell Alvania Grease . . . to Industrial Lubricants, Shell Oil Company, 50 West 50th Street, New York 20, N. Y.— or 100 Bush Street, San Francisco 6, Calif.

SHELL ALVANIA GREASE

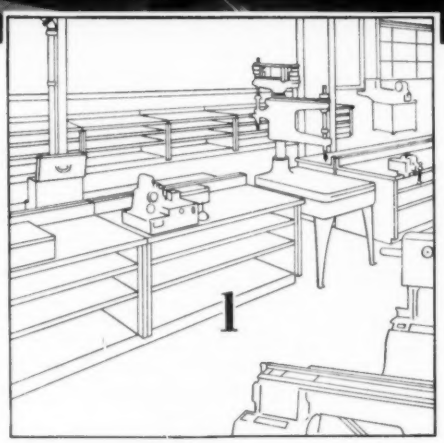
The True Multi-Purpose Industrial Grease

SHELL

For more facts circle 589 on Reply Card

MODERNIZING YOUR PLANT?
Fit it up FAST and at LOW COST
with standard HALLOWELL Shop Equipment

You'll save time—you'll save money. Whether you want to set up an assembly line, laboratory, toolroom or a whole plant, you can get everything you need—benches for individual use or continuous line, wall cabinets, tool stands, shop desks, chairs and stools. Let us send you complete details—then order standard ready-made units from your nearest HALLOWELL distributor. STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

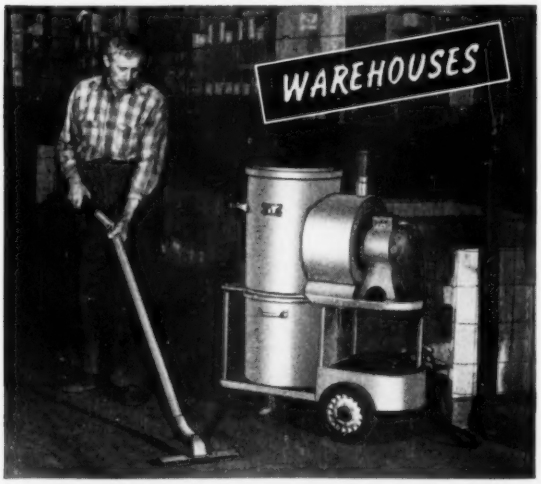


1. Cabinet Benches

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

For more facts circle 590 on Reply Card

INVINCIBLES
clean everywhere . . .



Regardless of the type of your business, Invincible Vacuum Cleaners remove all the dust and dirt fast and efficiently. Invincibles help keep your entire facilities—office, warehouse, research building, factory—cleaner, safer, more healthful and productive. Invincibles can also save you time and money by reclaiming or removing scores of industrial materials other than dust and dirt. Invincibles have been cleaning for industry more than 50 years. They're built for tough, trouble-free service; over 100,000 Invincibles are in use—5,000 for over 25 years. Let Invincible clean up your problem.

Send for illustrated Booklet which tells about Invincibles at work for industry.

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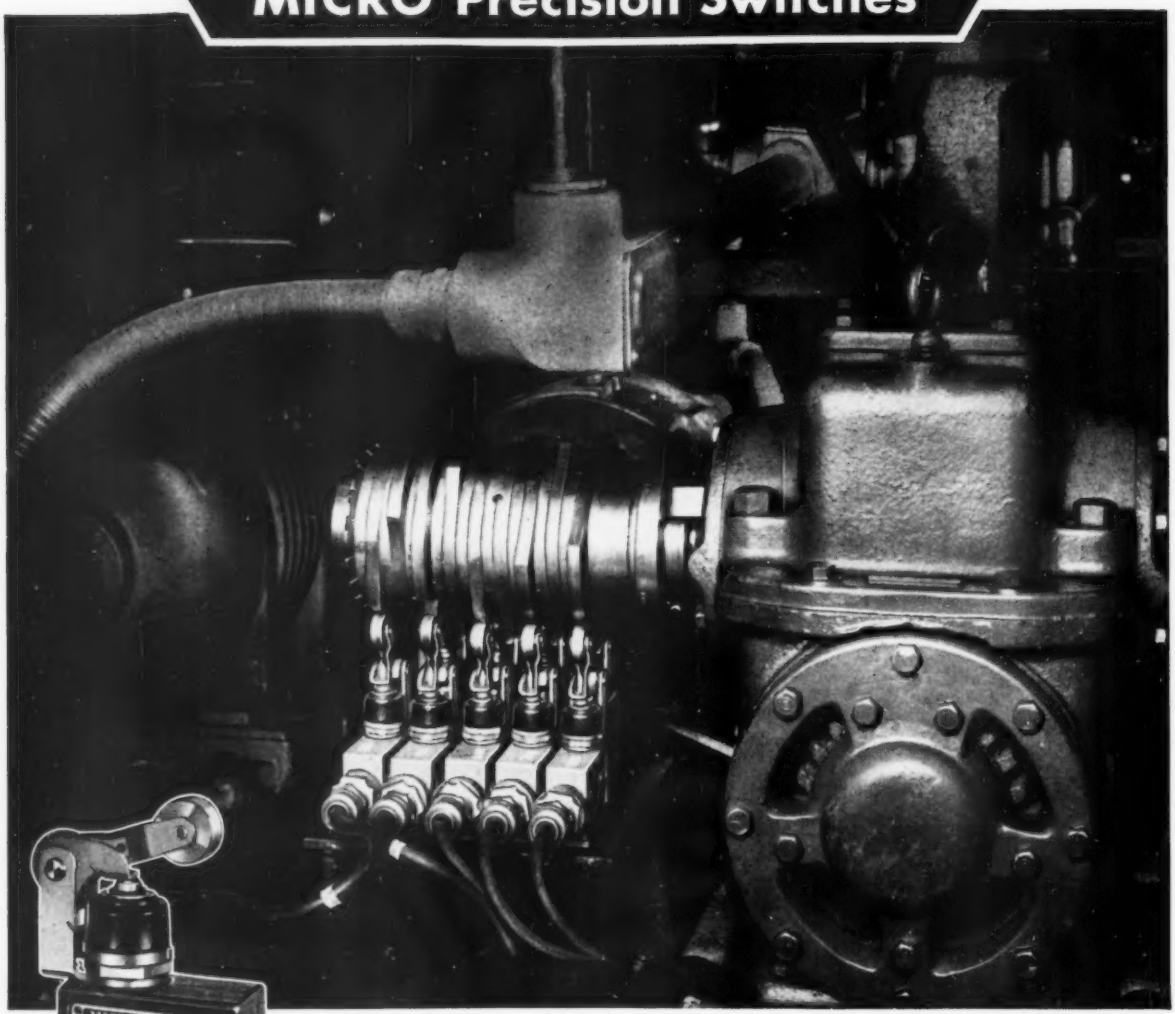
MICRO Precision Switches



Install 9 Micro Switches to control 4-second gaging cycle

• Making plant equipment more automatic is the first step toward making its operation faster, safer and more productive.

Nine MICRO switches are installed here to control all the movements and timing of a gage built to check uniform profile and alignment of ammunition rounds. They are operated by contact with timing cams on the output shaft.

The switches used in this application have die-cast enclosed housings and are protected against entrance of dust and dirt by a synthetic rubber boot. Roller arm actuators make perfect contact with the cams.

Full stocks of these and many other MICRO switches which plant superintendents, electricians and maintenance men have found invaluable for putting new life into present equipment, can be purchased from 174 Authorized Distributors in 154 key cities. Look under "Switches, Electric" in your phone book.

Do you read MICRO *Tips? Ask to be put on our mailing list. It is crammed with practical ideas on how these switches are used to increase production.*

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FREEPORT, ILLINOIS

H HONEYWELL

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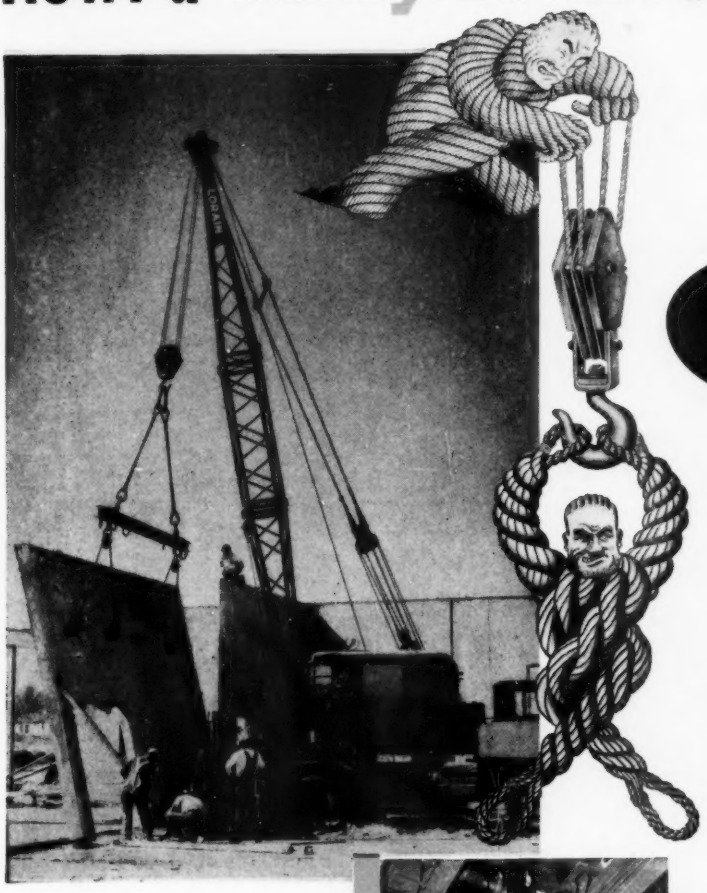
NOW! a Tuffy Team for Crane Hoisting

with
Maximum Flexibility
Wearability
Super Toughness!



NEW Tuffy HOIST LINES

Tuffy SLINGS

Tuffy Slings Are Preferred all along the line—by the buyer who must watch sling costs, by the safety engineer who must prevent accidents, and by the men who work with them. Tuffy's patented, 9-part braided wire fabric construction provides greater flexibility for easy handling, is so constructed as to resist stranding even when one of its 9 parts is cut or broken. Kinking and knotting cannot materially damage the braided construction. Tuffy Slings are also proof-tested to twice their safe working load.

New Tuffy Hoist Line now joins Tuffy Slings to give you a hoisting team that provides more service and safety from drum to load. Tuffy Hoist Line is especially designed for overhead, stiff leg and mobile cranes, for derricks and clamshells.

Forget Complicated Specifications on various rope constructions offered for hoist line service! Just state length, diameter and the name Tuffy Hoist Line. You'll get a rope that will cut hoist line costs and down-time, absorb load shocks and stay on the job longer than any rope you've ever used! Put the Tuffy Team to work for you and see the difference!

Just Ask Your Distributor for Tuffy

Tell him the diameter and the length—that's all you need to order your Tuffy Hoist Line. To order slings—it's simply Tuffy, type, length, diameter and fittings! Or, you can order Tuffy braided wire fabric on the reel, if you do your own rigging. Remember, your distributor is backed up by nearby mill depot stocks to insure prompt delivery.

Write for Sling Handbook and Rigger's Manual
containing 48 pages of useful information.
Also Tuffy Hoist Line folder.

union Wire Rope **corporation**

2272 Manchester Ave. Kansas City 26, Mo.

Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric

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Immediate delivery from stock!

When buying gauges ask for USG . . . where a most diversified stock awaits your selection. USG Gauges are stocked for your convenience. You can order any of a wide variety of instruments—233 types, dial sizes, and size ranges—without delay. Many of these gauges are obtainable immediately from the local stock of distributors of USG Gauges in principal cities throughout the United States. Or they may be ordered through your USG distributor directly from factory stock at Sellersville, Pa. Take advantage of this fast delivery service. Call the distributor of USG Gauges in your locality today for information on gauges.

United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Pa.

Three of the many types and sizes of USG Quality Gauges now carried in stock

UNITED STATES GAUGE

Quality Gauges Engineered for Enduring Accuracy

PRODUCTS OF UNITED STATES GAUGE... Absolute Pressure Gauges • Aircraft Instruments • Air Volume Controls • Altitude Gauges • Boiler Gauges Chemical Gauges • Mercury, Gas, and Vapor Dial Thermometers • Glass Tube and Industrial Thermometers • Flow Meters • Inspectors' Test Gauges Precision Laboratory Test Gauges • Marine, Ship and Air-Brake Gauges • Voltmeters • Ammeters • Welding Gauges.

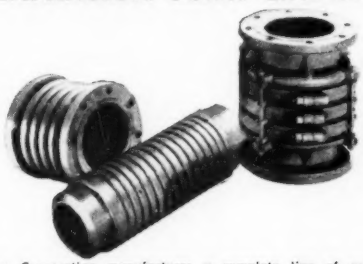
OTHER DIVISIONS OF AMERICAN MACHINE AND METALS, INC. AT SELLERSVILLE, PA.: GOTHAM INSTRUMENTS, AND AUTOBAR SYSTEMS

For more facts circle 594 on Reply Card

THIS NEW AUTHORITATIVE GUIDE TO PIPING MOTION CONTROL SHOULD BE AN IMPORTANT PART OF YOUR BASIC ENGINEERING FILE

The New FLEXON Expansion Joint Design Guide

THE FLEXON EXPANSION JOINT LINE-UP



Flexonics Corporation manufactures a complete line of corrugated type stainless steel and copper expansion joints in Free-Flexing (low pressure), Controlled-Flexing (high pressure) and Flexoniflex (extremely high pressure) units. Sizes range from ½" to 48". Units are available for temperatures from —400° F., to 1600° F., and for pressures from vacuum to 5500 psi. Write for further information or see the Flexonics catalogs in Sweet's Plant Engineering File, Chemical Engineering Catalog or The Refinery Catalog.

Now at last, comprehensive, up-to-date information on the absorption of motion in piping has been gathered together in one easy-to-use booklet. In its new Expansion Joint Design Guide, Flexonics Corporation offers an authoritative handbook of piping design and layout! Included in the booklet are thorough discussions of types of motion, design considerations pertaining to the physical characteristics of expansion joints and anchoring and guiding, typical piping layouts, computation of thermal expansion, safety factors and many other vitally important factors in piping design.

Much of the information presented is available nowhere else; all of it helpful to anyone responsible for the design, installation or maintenance of piping. Copies of the Flexon Expansion Joint Design Guide are available without charge. Write for your copy, today.

See Us at
Booth 1144, Plant Maintenance Show

EXPANSION JOINT DIVISION

Flexonics Corporation 1340 S. THIRD AVENUE • MAYWOOD, ILLINOIS

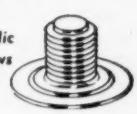
FORMERLY CHICAGO METAL HOSE CORPORATION
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies products of Flexonics Corporation that have served industry for over 50 years.

Flexible metal hose

Expansion joints

Aircraft components


Metallic bellows

For more facts circle 595 on Reply Card

Quick make and break...

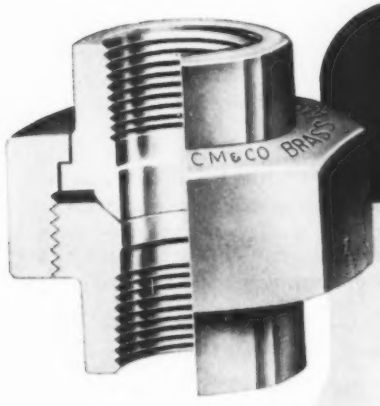
Precision built of forged steel with cold working pressures from a vacuum to 3000 pounds and maximum temperature of 500 degrees F. (with special "O" Ring).
The ends and nut are octagon in shape. The ends are tapped to Briggs Standard steam threads.
HANDLE-BAR
Nut threads are rust-proof, spark-proof, and permanently lubricated with Udylite Cadmium.
A positive pressure seal is effected with a synthetic oil-resistant "O" Ring set in a groove between the two mating surfaces. Replaceable "O" Ring will not drop out when union is disconnected.

...unions

HANDLE-BAR "O" RING

QUICK TYPE UNIONS

These unions are volume produced from forgings to finished union in our own plant to provide price and performance at its best. They do not depend upon compression or force as the terms relate to common gasket type unions. Hand tightening of nut will hold rated pressure. "O" Ring unions are recommended for mud, cementing, crude oil, lube oil, natural gas and water and vacuum services. Excellent for acidizing, fuel oil, kerosene and gasoline.



"HYDRO BRASS"
Hot Forged All Brass
A.A.R. Design

"HYDRO DUAL"
Forged Brass Ends
Carbon Steel Udylited Nuts

A prominent feature of forged brass is that it is completely free from porosity common to all castings. A much finer grain structure with greater density and strength throughout is evident when compared to castings.

Write Department P for additional information or refer to listings in the Refinery or Composite Catalogs.

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

For more facts circle 596 on Reply Card

NEW PRODUCTS

(Begins on page 134)

30—AIR CLEANER features push-button wash cycle

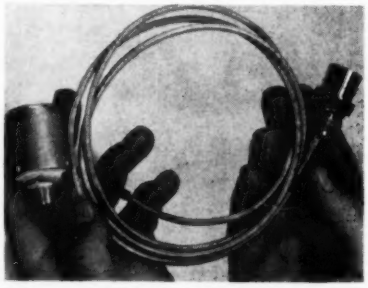
The PX Precipitron, a low-cost electronic air-cleaning unit, is designed to combine high cleaning efficiency with a simple push-button method of spray-washing, which eliminates inside-the-duct washing of cells.

Accumulated dirt on the electronic collector-plate surfaces of the unit is flushed away by hot water from nozzles attached to a motorized header. After moving slowly across the unit's face, the header automatically reverses and returns to the start position. The same traveling header applies an abrasive oil to the collector-plate surfaces when washing is completed. The oil binds collected dirt together and acts as a solvent for the wash operation. Height and width of the unit depend on cleaning requirements of a proposed system. Power packs and control units are located inside the duct. Westinghouse Electric Corp.

31—VIBRATION DETECTOR for large rotating apparatus

This crystal-type accelerometer is designed as as basic detection element for measuring vibration acceleration up to 50 G. It is intended to meet requirements for use on turbine generators, large motors, blowers, steam and gas turbines and centrifuges, which demand critical vibration detection if left unattended for long periods since excessive vibration can be damaging.

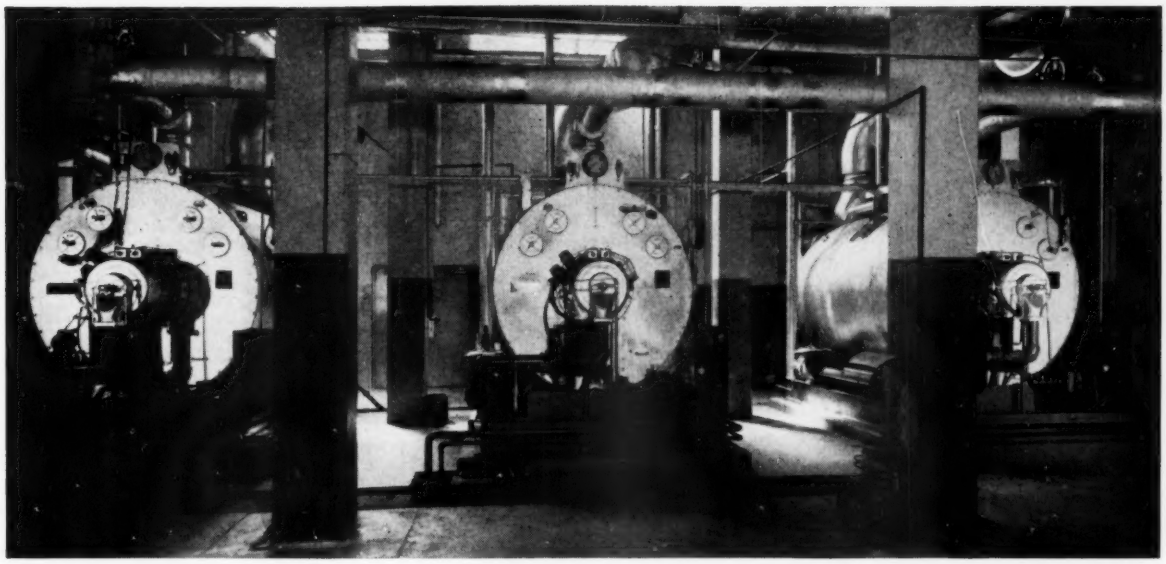
Sensitivity is given as approximately



0.9 v per G. Minimum lateral or torsional sensitivity, due to rigid support, helps provide reliable measurement. A stud type mounting transmits forces to the crystal assembly. Output voltage of the detector is proportional to acceleration imparted to the equipment on which it is mounted, but only in a direction perpendicular to the mounting plane. Auxiliary equipments required are an amplifier, rejection filter, and indicator.

The six barium titanate crystals making up the stack, each of which is silvered to provide two electrodes, are cemented together with thermal setting cement. Connecting leads are soldered along each edge of the finished stack for positive electrical connection to the sensing element. This is also said to eliminate changes in sensitivity due to

IN ALL TYPES OF BUILDINGS



This installation was made by Continental Engineers, Inc., mechanical contractors, of Atlanta. Gas is supplied by Atlanta Gas Light Company.

Powermaster® Efficiency Pays Off

For example: Only $1.15 per month per apartment average fuel costs the year around for Heating, Hot Water and Air Conditioning for 535 apartments in Howell House at Atlanta, Ga.

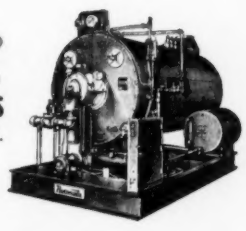
These services in this new modern building are supplied by three *Powermaster* Packaged Automatic Boilers at this amazingly low cost for gas and oil fuel. Providing year-round services with the boilers result in maximum operating economy. Yet fuel saving is only one reason *Powermaster* is so popular with those who select, install and operate boilers for all types of buildings—offices, hotels, institutions, churches, housing projects, etc. Cost-saving installation, space-saving compactness, fast steaming, hospital-clean operation, dependability, maintenance-saving accessibility, fully automatic operating and safety controls, and smokeless combustion are others. Compare *Powermaster* with any other packaged automatic boiler and you'll see why it is today's best buy for schools, industrial plants, laundries, and other requirements as well as for all types of buildings. Send for latest descriptive bulletin.

O·S

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **Morgantown Road, Reading, Penna.**

For more facts circle 597 on Reply Card

At the Touch of a Button

...FASTER HANDLING, LOWER COST

● Here's how a typical plant turned a slow, costly handling job into a simple push-button operation. Consider the savings you might get in time, money and manpower by following a similar step.

The job was to remove wire from winding drums and convey it to the next operation. To reduce costs, a new idea was tried: a ½-ton, single I-BEAM READING ELECTRIC CRANE was custom-built for the job. All motions were motorized. Now one man controls the entire operation faster and more economically—by simply pushing the right button!

If you, too, are looking for a way to speed up your own materials handling, and save money doing it, here's the step that can pay off for you. Simply get in touch with READING. At no obligation, one of our engineers will gladly analyze your handling requirements and give you a practical recommendation for obtaining the results you want. A note on your letterhead will put him to work.

Reading Crane & Hoist Corporation, 2103 Adams Street, Reading, Pa.

READING CRANES

CHAIN HOISTS · OVERHEAD TRAVELING CRANES · ELECTRIC HOISTS

For more facts circle 598 on Reply Card

NEW PRODUCTS

(Begins on page 134)

corrosion of pressure-type contacts.

With a frequency response of less than 1 db rise at 1000 cps, the accelerometer's lowest resonance is greater than 2500 cps with a capacitance of 300 micro-micro-farads, it is noted, and temperature effect is ±5 per cent from -20 to 80 C. General Electric Co.

You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of the ad.

32—GEAR MOTOR for use in hazardous locations

For places where dangerous fumes, inflammable gases, explosive substances or combustible dusts may exist, this right-angle Syncrogear with explosion-proof motor is announced. Available in 1 hp rating with speeds from 45 to 155 rpm, this three-phase a-c motor, the Type SESV-GW, is designed to comply with UL specifications for Class I, Group D, and Class II, Groups F and G service. It embodies splash lubrication, a hardened and ground worm, normalized castings and asbestos-protected windings. Like other gear motors in this company's Syncrogear this incorporates a cantilever design to protect gear alignment. U.S. Electrical Motors Inc.

33—LUBRICANT SPRAY is available in two types

A new idea in an aerosol type bomb for spraying a fine mist of sub-micron size particles of molybdenum disulfide over and into friction surfaces is offered in two types. Lubri-Mist 1 has a volatile carrier giving dry lubrication, while Lubri-Mist 2, with a synthetic oil carrier, offers an oily surface. Molysulfide has the lowest coefficient of friction of any substance commercially available, company states; also it will not wash off with water, solvents or other chemicals and won't wear off readily. It is also said to "plate" without "build-up," to be unaffected by high temperatures and to leave no carbon residue. Lubri-Mist comes in 12-oz and 6-oz sizes. Lubri-Mist Co., Inc.

34—MOUNTINGS for heavy machines are self-leveling

Installing and leveling heavy machinery in minutes, without bolting or shims, is claimed possible with the Series LM3 and LM5 Barrymounts. These vibration isolators are designed to provide mobility of machine tools—they lift a machine to the required height for leveling by a turn of the attaching bolt. Of the several advantages attributed to these isolators, the first is reduced installation and maintenance costs. Also, these mountings

CITY WITHOUT COAL

Without coal a great modern city is a helpless cripple. Heat. Lights. Refrigeration. Transportation. Elevators. Signal systems. Telephone. Industry. All these depend on coal.

One modern city came near such paralysis. That was Berlin in 1948 when the Russians thought to strangle it into submission. Of all the cargo flown into Berlin, 64% was coal. Nearly 1,500,000 tons. Enough to fill 30,000 big, hopper coal cars. That coal was like new blood in a dying man's veins.

We don't fly much coal here in America—occasionally to an arctic defense base or a bag dropped to a storm-isolated farm house. Coal is something we have always taken for granted. There's plenty to last a thousand—maybe two thousand years. It is widely distributed; and the great coal-hauling railroads like the C&O are equipped to move it rapidly.

For instance, the C&O has invested many millions of dollars in great coal-handling docks at Newport News and Toledo to facilitate water shipments to Atlantic and Great Lake ports.

Coal is one natural resource you don't need to worry about. It is the one fuel that will always be plentiful.

Bring your fuel problems to C & O

As the world's largest carrier of bituminous coal, the C&O is intimately familiar with every phase of coal use. We have a large staff of experts who will gladly help you to locate the coal best suited to your needs; to help you use it most efficiently; to help get it to you most economically.

Write to:
Coal Traffic Department
Chesapeake and Ohio Railway
2111 Terminal Tower
Cleveland 1, Ohio

Chesapeake and Ohio Railway

COAL...FUEL OF THE FUTURE

For more facts circle 599 on Reply Card

GARLOCK Service-Tested LEATHER PACKINGS

Available in ALL SHAPES, ALL SIZES, ALL TANNAGES and ALL TREATMENTS

GARLOCK'S modern, completely equipped leather packing manufacturing plant has the facilities to furnish *all types* of leather packings. This plant maintains the same high standards of materials, design, workmanship, and inspection that Garlock has upheld for the past 66 years in the manufacture of mechanical packings.

SHAPES

Molded Cups **"U" Packings**
"V" Packings **Washers** **Gaskets**
Discs **Flange or Hat Packings**

SIZES

All sizes suitable for leather packing applications from 1/8" O.D. (such as leather washers for needle valves) to 99" O.D. (such as large "U" packings for heavy duty hydraulic service).

TANNAGES

Oak **Chrome** **BITAN***

Garlock Bitan combines the heat and oil-resisting qualities of chrome with the fine grain, non-porous, strong qualities of oak.

TREATMENTS

Oil, grease, or wax treated (and combinations of these impregnants)—in degrees of hardness from extremely soft and flexible to very hard and rigid.

Synthetic rubber impregnated—combines the high tensile strength of leather and elasticity of rubber, and gives greater temperature resistance.

With fabric liners.

Untreated—for certain low pressure water applications.

Put your leather packing problems up to Garlock. Contact your Garlock representative or write for leather packing folder today. *Registered Trademark

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago Cincinnati • Cleveland • Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia • Pittsburgh • Portland (Ore.) • Salt Lake City San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS
MECHANICAL SEALS
RUBBER EXPANSION JOINTS

For more facts circle 600 on Reply Card

NEW PRODUCTS

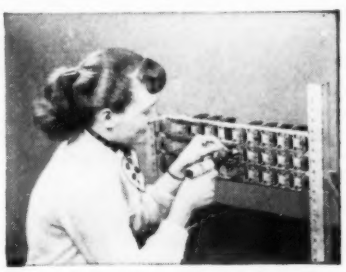
(Begins on page 134)

prevent "floor walking" of heavy machines because, as manufacturer points out, they are engineered to isolate all modes of vibration.

Since they are designed to absorb the pounding which affects many machine settings, the new Barrymounts also mean fewer adjustments on precision machinery, and thus fewer rejects. Their use is also said to result in a decrease in plant noise level and to provide a money-saving mobility that allows for the shifting of heavy machines for retooling, repairs or improved production flow. Series LM3 and LM5 Barrymounts permit height adjustments up to ½ in. and are designed for loads up to 4200 lb per Barrymount. Barry Corp.

35—WRAPPING TOOLS for electrical connections

Solderless wire-wrap connections made with appropriate terminal and wire sizes, and wrapped with this wire-wrap tool, are claimed to be mechanically and electrically equal to soldered connections. In making wrap and solder connections, the tool replaces the hand method of wrapping wire on the terminal, prior to soldering. This method can be used on many terminal designs.



Other wire-wrap tools in production consist of an air tool with straight handle, an air tool with pistol grip handle, and an electric tool with pistol grip handle. Wrapping bits are available for handling 20-, 22-, or 24-gage wire on terminals having a maximum width of 1/16, 3/32, or ⅛ in. Wire-Wrap Division, Keller Tool Co.

36—FLUORESCENT FIXTURE offers improved lighting

By means of a new development, the Para-Louver, this manufacturer has lowered the lengthwise brightness of the Alzak Aluminum Parabolic Troffer from its previous 1.2 candles to approximately 0.6 candles per square inch, it is announced without changing the efficiency of the fixture. This means that this troffer can be installed at any angle with comfort, says company.

For years this troffer has been made with parabolic shaped side panels to reflect light downward. When these fixtures were viewed crosswise, there was a brightness of only 0.2 candle-

Tailored to fit the TIGHT spots!

NEW improved design MULTI-DUTY FILTER now available in 3', 4' and [redacted]

3'+3'+3'=9' and 4'+5'=9'. What's the difference? Plenty—costwise—it means you can install a 9-ft. wide filter with *two sections* instead of *three*. That's why the new Multi-Duty, with addition of the 5-ft. section, permits you to select the most economical combination of filter widths to fit a limited space.

And that's just a starter! New chain and sprocket design reduces over-all depth of the Multi-Duty by 5½ inches. Improved panel design features through rod suspension. More positive air seals eliminate possibility of oil seepage.

Greater versatility, lower installation costs, important space savings—you get them all with the new Multi-Duty. And what else? The proved performance and dependability of America's "most specified" automatic, self-cleaning air filter! Call your local AAF representative for complete product data, now, or write for Bulletin No. 241.

American Air Filter
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.
For more facts circle 601 on Reply Card

AAF

HERE'S FULL-TIME PROTECTION FOR TEMPORARY CIRCUITS

For temporary circuits needed in construction work and other outside jobs, the Heinemann "Receptacle-Type" Outdoor Service Unit provides on-the-spot power with full circuit protection.

Combining convenient utility with absolute protection, this Heinemann Outdoor Service Unit has wired-in receptacles for tools, pumps, floodlights and other equipment. It's a portable, fully protected service unit that can be carried from job to job . . . without makeshift arrangements. The only connections needed are those directly to the line.

As Heinemann Circuit Breakers employ no thermal elements, current capacity of the unit is not affected by summer or winter temperature extremes—an especially important feature in outdoor equipment.

Should a fault in the line trip the breaker, the user restores current simply by switching the handle to the "ON" position. There is no confusing reset position . . . no need for the power company to make extra service calls.

"Receptacle-Type" Outdoor Service Units are housed in rugged, weather-proof enclosures which may be padlocked to prevent tampering. Plug-in receptacles are on the bottom. Also available with spring-hinged door to enclose receptacles when not in use.

For complete details, write for Bulletin 2013

HEINEMANN ELECTRIC CO.

128 PLUM STREET • TRENTON 2, N. J.

HEINEMANN Circuit breakers

For more facts circle 602 on Reply Card

NEW PRODUCTS

(Begins on page 134)

power per square inch at 35 deg below horizontal—but the lengthwise brightness was about 1.2 within the shielded angle. While not excessive for some installations, this brightness was not in line with the crosswise brightness.

To improve this condition, company engineers designed a parabola type louver, divided into segments and projected onto a flat surface. Then a second series of parabolas with an axis to reflect the light upwards was designed to join the larger segments so that all of the light would be controlled. A booklet on the fixture is available. Day-Brite Lighting, Inc.

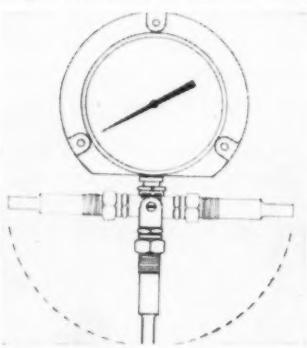
37—BLOWER for moving air at temperatures to 350 F

Besides being designed to handle air at temperatures up to 350 F, this blower can be used for air containing acids, alkalies or fine abrasive dust, company says, without fear of premature failure of belts and bearings. A modification of the manufacturer's standard belt-drive vaneaxial blower, this new high-temperature model comes in the same range of sizes, 12 to 54 in., and air deliveries are the same.

On the new blower, the addition of a special dummy section containing the guide vanes makes possible the location of the drive on the negative pressure side of the blower. With this arrangement, clean air from outside the duct is drawn in through the belt tube and over the bearings. According to manufacturer, this removal of vulnerable parts from contact with destructive elements in the airstream promotes long service life and trouble-free operation under adverse conditions. Hartzell Propeller Fan Co.

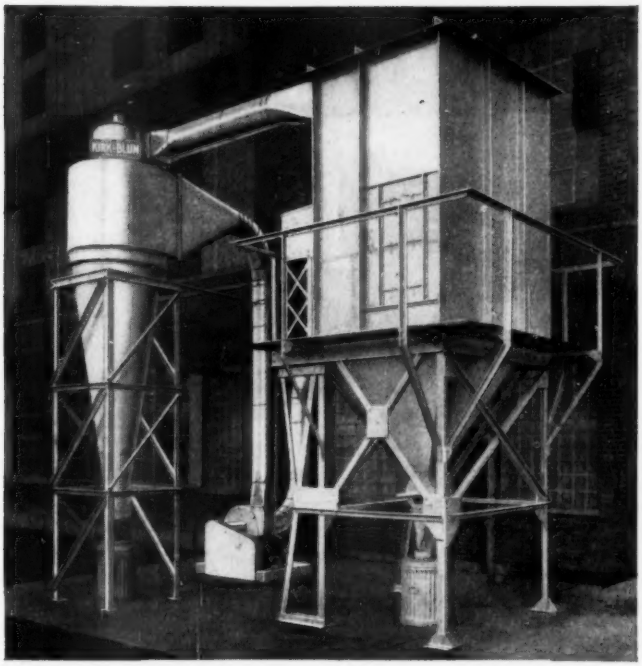
38—DIAL THERMOMETER with flexibility of mounting

The Multi-Angle is an adjustable angle dial thermometer so designed that it can be rotated and tilted to any practical mounting angle and locked in position by a few turns of one nut. It may



be used wherever a direct connected temperature indicator is required. The standard unit has a stainless steel thermal system, bronze bushed move-

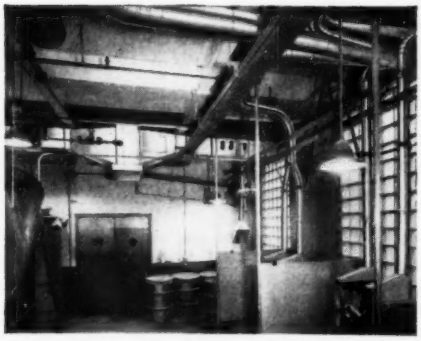
Two-stage air cleaning: high efficiency centrifugal collector (at left) plus cloth media filter.



pharmaceutical manufacturer finds

KIRK AND BLUM DUST CONTROL

"just what the doctor ordered!"



To maintain rigidly controlled and conditioned plant atmosphere, air returned from cleaning operation is heated or cooled as required.

To insure, in all manufacturing steps, the purity of The Wm. S. Merrell Company's products, Kirk & Blum Dust Control Systems were installed by this well known pharmaceutical manufacturer. Dust is eliminated at its source to meet the plant's strict requirements. Since the building is air conditioned, cleaned air is tempered (warmed or cooled) before it is returned to the plant.

Whatever your problem, put it up to experts in air handling . . . KIRK & BLUM—with over 46 years' experience in Dust and Fume control.

KIRK AND BLUM
DUST CONTROL

FOR ILLUSTRATED LITERATURE . . . WRITE TO

THE KIRK and BLUM MANUFACTURING CO.
3207 FORRER STREET, CINCINNATI 9, OHIO

For more facts circle 603 on Reply Card

figured right!

built right!

TYPE O BLOWERS — for supplying air at high pressures. Wide range of sizes to meet almost any capacity and operating speed requirements.

IMPROVED EXHAUSTERS for many types of medium pressure air handling services and for pneumatic conveying. Fans can be specially built for special applications.

READY UNITS — for factory ventilation installed either indoors or out-of-doors. Furnished complete with motor and V-belt drive. Capacities to 12,000 c.f.m. Unit shown equipped with outdoor covers.

You can have faith in a Clarage recommendation — faith that your job is figured RIGHT for the required performance — faith that the equipment is built RIGHT to operate year after year with minimum attention and care.

Regardless of what your fan problem may be, we can meet it satisfactorily and with surprising economy. Your inquiry is invited. CLARAGE FAN COMPANY, Kalamazoo, Michigan.

CLARAGE Service Manual

68 PAGES OF VALUABLE DATA

New Manual shows how to properly install and service Clarage fans, blowers and air conditioning units . . . valuable information adaptable to almost any type of fan job. Sent without charge to factory executives, engineers and maintenance officials.

You can Rely on... CLARAGE

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SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Clarage Fans, Ltd. 4281 Richelieu St. Montreal

For more facts circle 604 on Reply Card

NEW PRODUCTS

(Begins on page 134)

ment, molded phenol case, black dial and white pointer. It is furnished in standard mercury ranges, and in 4½-, 6-, and 8½-in. sizes with union connection or separable socket. As manufacturer points out, the Multi-Angle can provide that "odd-angle" thermometer which might otherwise need to be made to order. It affords easy reading from any angle and easy changeability from one angle to another before or after installation. A descriptive bulletin is available. United States Gauge Div., American Machine and Metals, Inc.

39—TERMINAL JUNCTION BOX in eight standard sizes

Terminal junction boxes in NEMA Type XII construction, designed primarily for machine tool application, are available in eight standard sizes, the largest accommodating 168 25-amp terminals. Fifty- and 100-amp terminals can also be used in combination with the 25-amp terminals. External mounting feet are provided, and the hinged door is gasketed with sponge Neoprene to prevent entrance of oil or coolant.

Terminals are mounted on removable straps away from the back of the enclosure to insure sufficient wiring space. Since knockouts are not provided, the box may be entered as desired. This no-knockout construction is also said to eliminate loosening of unused knockouts. Square D Co.

40—PHOTOELECTRIC CONTROL for outdoor lighting

This photoelectric control for series or multiple outdoor lighting circuits is built around a dip-soldered etched circuit, simplifying maintenance. Built-in lighting protection is provided. Types P-1 and P-1A offer low level illumination; Types P-2 and P-2A, high level. Plug-in elements are interchangeable with all manufacturer's previously supplied types and those used in street lighting luminaires. Type P-1 units are converted to Type P-2 by addition of a phototube shield.

The control is designed to be operated under any conditions at a light level from 1 to 6 or 10 to 60-ft candles at "sky view" of the phototube. The "sky view" shield acts to permit maximum light from the sky to strike the phototube while minimizing stray lights from surrounding sources such as signs and headlights. Greater sensitivity at lower light levels is provided by high amplification of the two amplifier tubes. Phototube light is estimated at 20,000 hours; amplifier tubes, 10,000 to 20,000 hours. It is claimed the photo cell actually "measures" the amount of sky light.

The control is expected to be particularly suited to outlying areas not served by series circuits, where it can control one or more lamps up to rated capacity. Available in either 575 or 3500 w capacity. General Electric Co.

PUMPS

for INDUSTRY

FLUID POWER PUMPS

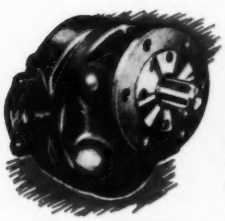
The most comprehensive range of types, capacities and pressures in Hydraulic Pumps for industrial equipment, presses, machine tools, materials handling, metal working, mobile equipment, mining, petroleum, gas and aviation applications. Hydraulic Pumps, Motors, Cylinders and Valves to develop complete Hydraulic circuits.

LIQUID HANDLING PUMPS

An exceptionally broad range of types, sizes and special constructions to handle virtually "any substance that will flow through a pipe" including: water, petroleum products, alcohols, syrups, acids, sludges, slurries, asphalt, bunker fuel, etc.

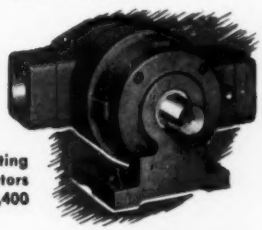
VACUUM PUMPS

High Vacuum Pumps for laboratory, electronic, atomic research, biological and other chemical processing, vacuum refining of metals, de-aerating, dehydration, vacuum drying, refrigeration.



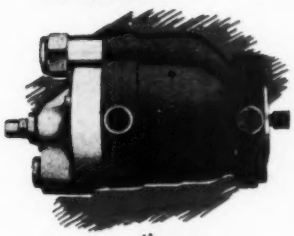
HYDRECO
GEAR TYPE PUMPS

Reversible and non-reversible. Gear type pumps in exclusive FOUR-BOLT design . . . capacities from .5 to 130 gpm and operating pressures to 1500 psi . . . flange or foot mounted . . . furnished with keyed shaft with spline shafts optional. Also dual and tandem models.



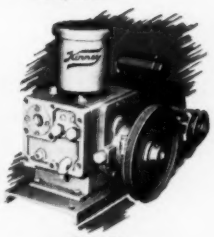
DUDCO
DUAL VANE TYPE PUMPS

DUDCO Pumps provide a broad range of sizes with capacities to 120 gpm and pressures to 2000 psi. Also available in dual units operating from a single drive. Hydraulic motors with starting torque outputs to 14,400 lb. in.



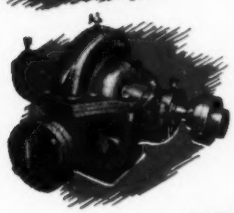
STRATOPOWER
PISTON TYPE PUMPS

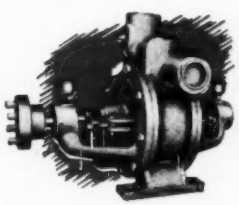
Axial reciprocating piston type . . . constant or variable delivery with capacities of .25 to 10 gpm at nominal speeds of 1500 rpm with maximum of 4500 rpm . . . working pressures to 3000 psi . . . direct engine and individual electric motor driven models.



KINNEY
VACUUM PUMPS

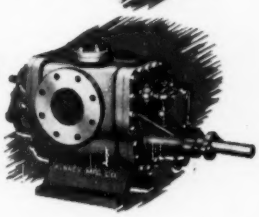
Single stage models to produce absolute pressure readings of 10 microns (.01 mm Hg.) . . . compound pumps producing readings of .2 microns (.0002 mm Hg.) or better. These Kinney High Vacuum Pumps are available in sizes for laboratory as well as high production use.





KINNEY
LIQUID HANDLING PUMPS

A complete range of sizes in Rotating Plunger and Herringbone Gear Pumps to handle light or heavy liquids from gasoline to molasses. Available in plain or steam jacketed models.



AURORA
CENTRIFUGAL & TURBINE PUMPS

Deep well, sump, drainage and condensation return units, household water systems. Industrial low and high pressure liquid handling pumps. Direct motor and countershaft driven horizontal and vertical models. Capacities 3 to 7500 gpm.

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the smooth-surfaced built-up roof—FLEXSTONE*

which provides a flexible covering of stone

Because they are made of the mineral, asbestos, the felts of a Johns-Manville Flexstone Built-Up Roof assure lasting service and protection. They will not support combustion. They effectively resist the drying-out action of the sun . . . won't rot, are weatherproof and need no periodic coating.

Flexstone Built-Up Roofs are smooth-surfaced . . . permit thorough drainage . . . make damage easy to locate and repair. These superior advantages are also provided by the J-M Flexstone Special Built-Up Roof . . . developed especially for dead-level decks.

For complete information about Flexstone Roofs and J-M Asbestile* Flashing System that provides thorough water tightness and effective treatment for critical roof areas, see your Approved Johns-Manville Contractor. He's listed in the Classified Section of the telephone directory. Or send for folder BU-51A. Write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.

*Reg. U. S. Pat. Off.

Johns-Manville FLEXSTONE* Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS DECORATIVE FLOORS • MOVABLE WALLS • ETC.

For more facts circle 606 on Reply Card

How Samsonite Luggage Cut $6,000 from Its Fuel Bill

(Continued from page 87)

By means of this variable speed drive, it is possible to operate the screw conveyor at any speed between 2.9 and 17.5 rpm, and thus regulate the amount of fuel delivered to the small cyclone and from there to the boiler fireboxes.

The variable speed drive is equipped with pneumatic control and is so inter-connected that the speed of the screw is automatically regulated by the boiler steam pressure, detection of smoke in the boiler breeching, and depth of sawdust in the storage bin. Figure 4 also shows the pneumatic control mounted on the variable speed drive.

On an increase in steam pressure, a regulator in the steam supply line changes the setting of the variable speed unit to decrease the amount of sawdust delivered to the constant speed screw. The reverse action takes place when steam pressure drops off.

Located in the boiler breeching is a photo electric cell. When this cell detects presence of smoke, the variable speed drive is slowed and the air jets are automatically set into operation. This additional over-fire air introduced into the firebox helps combustion and immediately stops the smoking.

High and low level detectors have been installed in both compartments of the storage bin. The variable speed drive operates at maximum speed when the sawdust level is above the low level detector. When the level drops to the low level detector, an automatic switch contact is made which positions the variable speed unit to operate on steam demand only, instead of on incineration. A manually positioned switch is available for use when the level is below the lower detector and it is desired to have maximum combustion or incineration such as when emptying the storage bin.

When the sawdust level reaches the high level detector, an alarm is sounded. The boilers continue to operate at maximum incineration, and at this time the boiler room engineer immediately has the hogger operation stopped. Maximum incineration will more than handle all material produced in the mills, so by stopping the hogger there is no danger of over-filling the storage bin. An effort is made to keep the bin as nearly full as possible at all times as this will assure having enough fuel for weekend burning in severely cold weather.

Figure 3 shows a view of the boiler room. The two battery-set boilers are shown on the right with the 10 in. diameter feed pipes coming from the small cyclone. The instrument board is in the center, while a new 500 hp boiler which has

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These new machines are typically TENNANT—designed for tough round-the-clock jobs . . . built to save you 35% to 80% in cleaning costs. And they're engineered for extra *years of service.*

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MODEL 75 SWEEPER—New! Pays for itself in about 1 to 6 months. Sweeps 100,000 sq. ft. per hour. Has instant reverse; dumps in 30 seconds.

MODEL K MACHINE—A proved time-saver. Cleans 16" path. Pulverizes and picks up in 1 operation; leaves clean, fast-trucking surface. Has many uses. Gas or electric models, to 7.3 hp.

MODEL 24 SWEEPER—The low-cost sweeper with big sweeper capacity. Cleans 24" to 36" path (with sidebrush); speeds 2 to 8 mph. Efficient brush and vacuum system, automatic clutch.

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TENNANT Established 1870 — INDUSTRIAL FLOOR MACHINES

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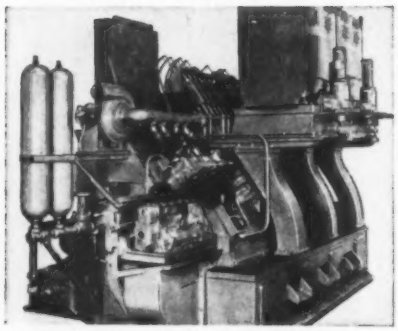
GREER TOPICS

Functions and Applications of the Greer Accumulator

Bunell's automatic cylinder trimming and forming machine incorporates two Greer accumulators to cut motorpump unit size by 50%. Slashed cost $600, weight 400 pounds and saved substantial floor space. Simpler circuit used few fittings for less maintenance.

How Greer Accumulators Reduce Power Requirements



Kreuger's huge Insert Valve Press uses 4 Greer accumulators to supply power needed to insert valves in auto cylinder blocks. The Greer accumulator reduced motor and pump requirements and assured the smooth, even flow of oil under pressure on circuit demand.

They store tremendous power in small space—deliver it instantly on demand of hydraulic system

As a primary source of hydraulic power where the work cycle does not depend on the flow of the pump or as auxiliary power in intermittent duty systems, the Greer accumulator has its most dramatic effects. In these applications, the Greer accumulator can save a great deal of power, reduce size and cost of equipment, and develop a much more efficient hydraulic circuit.

This compact and economical power package, with its unmatched ability to store power in small space, accumulates energy from the pump and delivers it instantly as required by the circuit, permitting small motors to do the work of big ones. For practical applications, read about the installation of Greer accumulators on the equipment as shown in photographs above and on left.

Greer's staff of expert hydraulic engineers are available for a discussion of your problem without obligation. Call or write Greer today.

Greer Hydro-Pneumatic Accumulators have many other diversified functions

(1) Pressure storage chamber for main, auxiliary and emergency power (2) Pressure-volume compensator for leakage and temperature (3) Dispenser of fluids and lubricants (4) Transfer-barrier for fluids and gases (5) Shock absorber for line shock and pump pulsation.

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U.S. PATENTS UNDER OLAER LICENSES

GREER ACCUMULATORS

Greer Hydraulics Inc. 454 Eighteenth Street, Brooklyn 15, New York

Field Offices: 1908 West Cermak Road, Chicago, Illinois • 25 South Main Street, Dayton, Ohio 2832 East Grand Boulevard, Detroit, Michigan • and sales representatives in all principal cities

For more facts circle 608 on Reply Card

just recently been installed is on the left. This new boiler is designed for oil, gas, and coal firing as well as for sawdust. At the present time this new boiler is used on a standby basis only.

Success of this system and the addition of the new boiler should satisfactorily handle any steam power requirements that may confront Shwayder Brothers for many years to come.

Bearing Maintenance

(Continued from page 110)

taken place in the bearings. Loosening the bracket bolts a turn or so at one end of the motor to allow the bracket to move a few thousandths of an inch, will reveal such a condition by a great reduction of the noise. The bracket bolts cannot of course be left loose and therefore the motor must be taken down and free endplay be established as a permanent cure.

If high temperature is due to the fact that the new bearing was too full of grease, it is worthwhile trying to let the motor cool down and be started a second time before attempting any other change. The cooling seems to re-distribute the grease so that less heating takes place the second time.

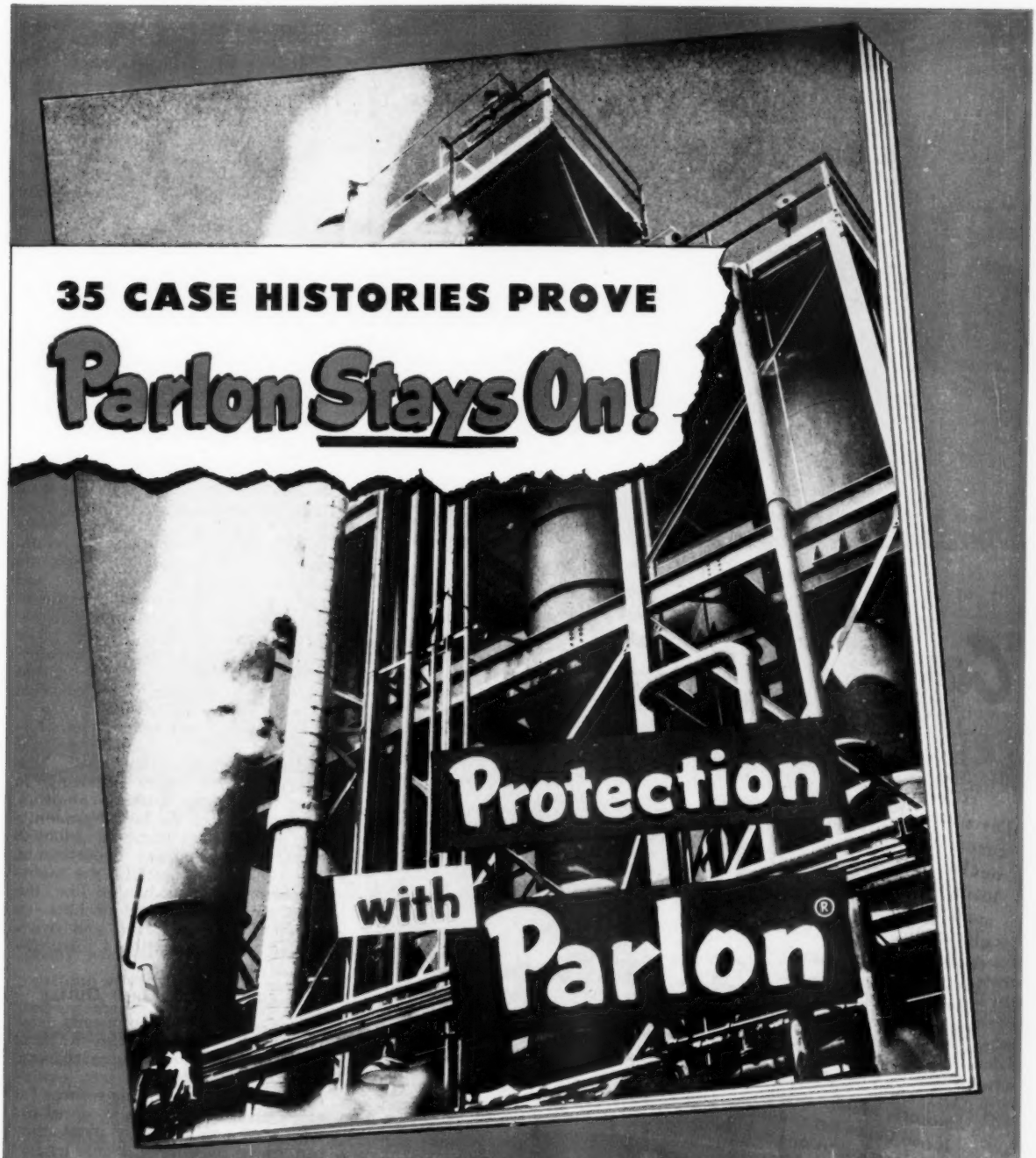
If only one bearing seems hot and noisy and the simple check of loosening the bracket bolts makes no difference in the noise, the bearing is probably too tight in itself but is not binding in its housing.

If a bearing appears very noisy but is normal in temperature, it is probably too loose. This may be due to wear if it is an old bearing or due to excessive clearance in a new bearing. Bearings which are very loose internally or are loose on the shaft or in the housing are apt to produce vibration in conjunction with a rumbling type of noise.

A single row type of ball bearing can be judged for proper looseness by the amount of axial rock which can be felt on the outer race after the bearing is mounted on the shaft. The amount of rock depends on the size of the bearing and should be between 0.005 to 0.010 in. as judged by feel. (Double row bearings are not judged by this method.)

To segregate bearing noise from other noises in the motor or from the surroundings, the ear of the observer may be pressed against one end of a metal rod (screw driver) while the other end rests against the housing to be checked.

If the noise emitted from the bearing varies in intensity, or is of a crackling type, it is probably caused by solid particles entrapped in the bearing. If the bearing is the greasable type, it should be cleaned and regreased or exchanged. If it is a pre-lubricated bearing, it should be replaced.



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If your maintenance paints are exposed to the abuse of acids, alkalies, salts, moisture, fungus growth; then here's a new 20-page booklet that should be on your "must" reading list.

"Protection with Parlon" is the story of what paints based on Hercules chlorinated rubber are doing wherever the challenge is greatest. In sewage plants and paper mills, in chemical plants and on ships, for exteriors and interiors, on concrete and metal; Parlon gives better service life at lower long-term costs. Book also contains chapter on surface preparation and the application of Parlon. Send for your free copy of this booklet today. Write:

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PARLON CHLORINATED RUBBER PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

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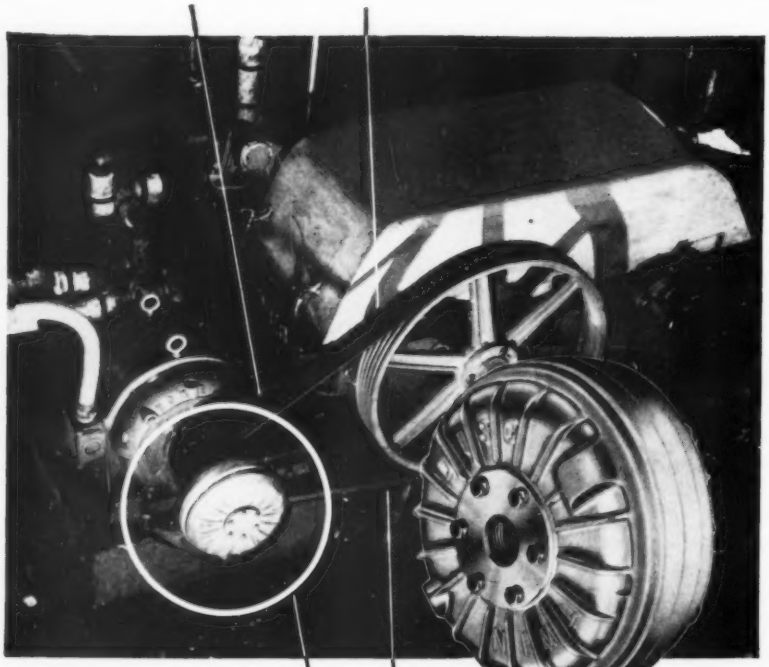
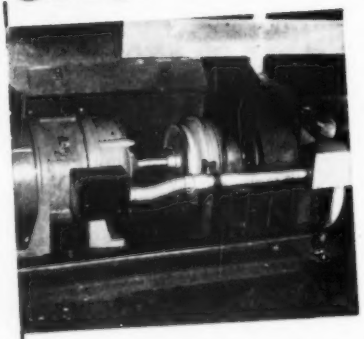


Cures Motor Burn-Outs with Fluid Couplings

Fort Niagara Corrugated Box Division of Robert Gair Co., Inc. cured two production "bottlenecks" recently. Heavy shock loads on two corrugating equipment units—working through mechanical drive—were burning their motors and breaking the corrugating medium. Niagara submitted the problem to the Twin Disc Hydraulic Dealer, the J. A. Webb Belting Co. of Buffalo, N. Y. By installing a HYDRO-SHEAVE® Drive and a Fluid Coupling on the motors, shock loads were cushioned out to permit quick, smooth acceleration to normal rpm.



Twin Disc 10.6 HYDRO-SHEAVE on a 25 hp 1750 rpm motor powering a single-facer corrugator drive (top of page) and, (below) a 17.5 Fluid Coupling on a 60 hp 1200 rpm motor powering the main corrugator drive. Inset, Twin Disc Fluid Coupling—available in sizes 6.25 to 27; capacities ¼ to 700 hp.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

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Vibration Isolators Speed Up Plant Changes

(Continued from page 117)

tive, and new models are constantly displacing the old. This was pleasant for the sales manager, but a headache for the plant engineer, who was called upon overnight to completely revise his layout for every new product adopted. This used to mean interrupted production schedules and lost man hours. Now, with the new mounts, this firm keeps a file of alternate production layouts, and can quickly convert to any new setup in minutes instead of hours. And this means regular "beats" to the distribution outlets.

Free Space, Machines

3) They can free formerly unusable plant space for additional production, as well as freeing the machines themselves. By dispensing with the need for reinforced concrete floors, and by cutting down vibrations that may rock the building to its foundations, heavy units can now be located in areas that had to be ruled out before. Because of the reduction in vibration, delicate gaging operations can take place alongside the stamping machine, while next door or underneath that area an office force can function without cottonstuffed ears.

4) General maintenance can become a more simplified, rational operation. Many industrial setups today require heavy servicing to keep them in top working condition. The mobility of the leveling mounts can permit large plants to establish central maintenance departments, and instead of trundling the maintenance to the production line, the small and medium sized machine can be completely removed and overhauled at leisure without interruption of the work flow.

Bigger Return, Less Outlay

5) Last, but by no means least important, mobility gives a plant bigger return on existing machinery, with less outlay for a new equipment. This can mean big returns for small business. Unable to afford the luxury of duplication of plant, they can move machinery from department to department and job to job, to take care of several assignments, with maximum efficiency.

Thus the mounts take the rigidity out of heavy plant investment, and give wings to the ideas of the imaginative production engineer. A different model mount has been devised for many diverse industrial needs. A new series now in production permits height adjustments up to ½ in., and these are capable of carrying loads up to 4,200 lb per mount—that is machinery tipping the scales at better than 8 tons. Other models are available which support up to 12,000 lb per isolator.

As never before...

Today we are all aware of the disastrous and far-reaching effects of a major industrial fire. Owners . . . management . . . employees . . . customers . . . almost every one suffers, in one way or another, when a serious fire strikes.

Could it happen to your plant? Now is the time to take a long, close look at your plant's fire protection measures. Remember, the local fire protection ordinances normally only set minimum standards. Compliance with these ordinances is no guarantee of fully adequate firesafety.

One way to be absolutely sure of the efficiency of your plant's fire protection facilities is to call in an expert C-O-TWO Fire Protection Engineer. He is ready and willing to help you with any or all industrial fire hazard problems.

There is a personal sense of responsibility inherent with C-O-TWO Fire Protection Engineers that assures you of fully adequate firesafety . . . a definite plus in your behalf. Whether it's fire detecting or fire extinguishing . . . portables or built-in systems . . . C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

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Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

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DON'T DRILL FLOORS — Simply use the correct type of UNISORB mounting pads, cement pads to floor and machine base, let dry overnight and the job is done.

REDUCE VIBRATION AND NOISE — Plant studies show 60% to 85% less transmitted vibration from UNISORB-mounted machines.

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NEW BOOKS

for the plant engineer

Adventures in Mathematics

FUN WITH MATHEMATICS by Jerome S. Meyer. Size 9¼ by 6 in.; 176 pp, illustrated; 1952 edition; cloth bound. Published by the World Publishing Company, 2231 West 110th St., Cleveland, Ohio. Price $2.75.

AN INTERESTING and readable treatment of mathematics has been prepared in this book. It covers some of the fine points of mathematics as well as a number of mathematical tricks and fallacies. The book is not only educational but entertaining.

One section is given to the mechanics of nomographs which are in themselves helpful tools for making mathematical short cuts. Another portion concerns itself with the making of a slide rule from an ordinary ruler. In contrast to the decimal system that we use the author explains and shows some interesting examples using the binary system.

Infinity, mathematical midgets, how the Romans multiplied and divided, magic multiplication square, e and logarithms, the circle, casting out nines, and Fibonacci numbers are some topics of discussion.

Organization of Industrial Research

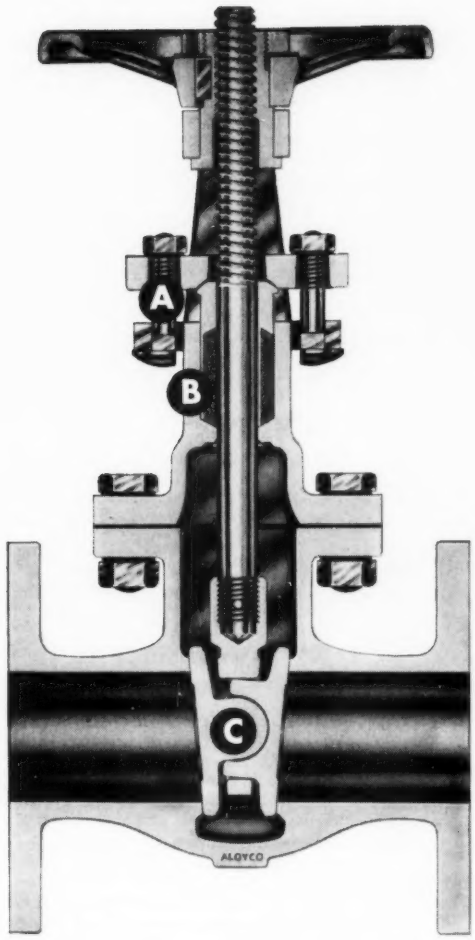
RESEARCH OPERATIONS IN INDUSTRY edited by David Hertz. Size 8½ by 5½ in.; xiv, 453 pp; cloth bound. Published 1953 by King's Crown Press, Columbia University Press, 2960 Broadway, New York 27, N. Y. Price $8.50.

COLLECTED PAPERS of the third annual conference on industrial research, 1952, and selected papers from the first and second conferences, sponsored by the Department of Industrial Engineering, Columbia University, comprise this volume.

Presented by and for management and administration, the eight sections of the book cover the philosophy, economics, planning and operation of research. Talks, each one followed by round table discussions reported at length make for a clear presentation of the individual papers.

There is a great deal of interesting information here; and, due to the nature of the material, much in the way of controversial statement.

The disinterested reader and the research man will find a particularly interesting section on what goes on "the other side of the fence" by Elmer W. Engstrom, vice-president in Charge of Research, RCA Laboratories Division, Radio Corporation



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• Prevent valve corrosion from eating into your production and profits!

How? Look to Aloyco, the world's largest specialists in the manufacture of corrosion-resistant valves, for the valve design and alloy that will give lasting, maintenance-free performance.

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B. Teflon packing for stuffing box (optional).
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This alloy was specifically developed to provide corrosion-resistance against a wide range of sulphuric acid concentrations and temperatures.

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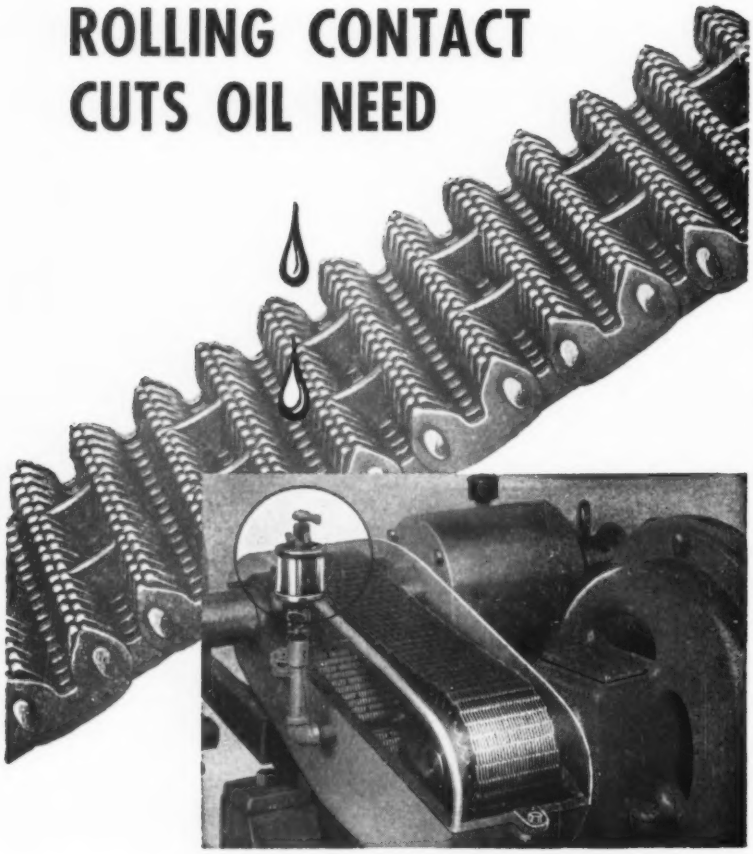

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There's mighty little friction in a Ramsey Silent Chain drive, because each link as it starts round the sprocket moves with a *rolling contact* in relation to adjacent links. No rubbing, no stiffness—just a smooth, slick, vibrationless flexibility that conveys power without drag and with practically no measurable loss.

This is why Ramsey Chain users are free of lubrication troubles and complications. No need for an oil-bath—a few drops of oil per day are enough. And of course it means longer lasting chains, and less maintenance.

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of America. The section is recommended to all potential research workers.

Generally, the book makes a readable, compact source of information on how big business conducts its research operations, and offers an exchange of ideas between the various firms participating in the conferences. There is an additional chapter on technical information services for business, which would be more helpful if the supercilious personal opinions were omitted; and one on methods of communications of research results, which notes the most usual and useful methods.

Refrigeration

TRANE REFRIGERATION MANUAL. Size 11 by 8½ in.; 125 pp; illustrated; spiral bound, paper cover. Published by the Trane Co., La Crosse, Wisconsin. Price $1.50.

THIS IS a completely revised edition of the previously published manual. It gives practical, easy-to-understand information on installation, operation and servicing of refrigeration equipment.

Two new chapters are included in this late edition on refrigeration piping, embodying the latest engineering data on the subject.

Other changes include a new chapter on refrigeration system control, a revised chapter on service operation and a completely revised refrigeration system service analysis chart.

The book offers material on the selection, installation and servicing of all the component parts of refrigeration systems, including evaporators, compressors, condensers, expansion valves, motors and control equipment and other equipment.

All About Pipe Bending

PIPE AND TUBE BENDING by Paul B. Schubert. Size 6 by 9 in.; illustrated; 183 pp including index; cloth bound. Published by The Industrial Press, 148 Lafayette St., New York 13, N. Y. Price $5.00.

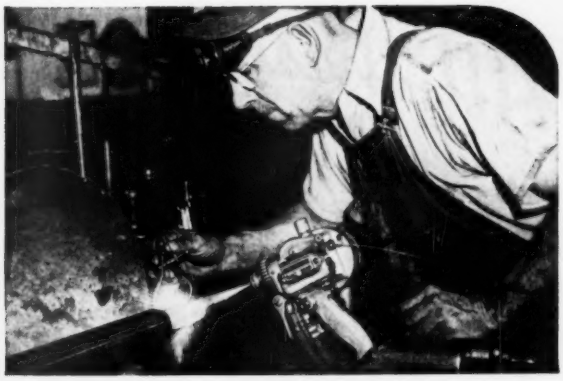
COMMON METHODS of bending ferrous and non-ferrous pipe and tubing are described and illustrated in this practical working manual. The machines, fixtures, and devices used, plus data and pointers that are useful in both shop and field are included.

In the first chapter a description of the various methods of bending is given together with applications to which the different methods are suited. In subsequent chapters, each method is taken up in detail.

An interesting chapter is devoted to the layout of pipe for bends, plus formulas employed for various degrees of bend and valuable information and data concerning minimum radii of bends.

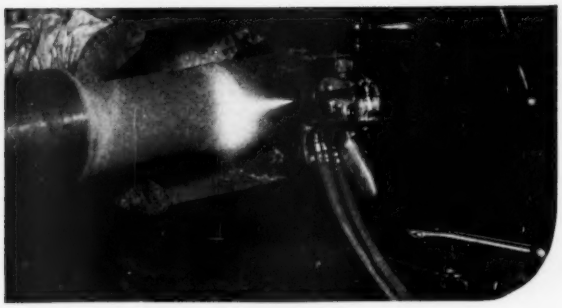
Information on some of the topics

NOW... new gun makes metallizing a bigger time-and-money saver than ever before



Salvaging worn feed roll journal for textile mill.

Building up 6" dia. by 12" lg. bearing section on shaft from heavy duty crusher with .25 carbon steel.



New Metco Type 4E gun sprays 40% faster than older models; produces uniform coatings with minimum operator skill; lower cost operation with minimum maintenance.

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Full circle 54-in. Bradleys accommodate up to 10 persons simultaneously. Model shown is pre-cast material. 36-in. models (up to 6 persons) also made.

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Many prefer the two-person foot-controlled sanitary Duo-Washfountain for the smaller washrooms, and at cafeteria entrances, in laboratories, schools, office buildings, etc.

The Duo has no faucets to touch—the sprayhead supplying clean tempered running water. The bowl is self-flushing and water is not wasted since supply is automatically cut off when foot is removed from control pedal.

Standardizing washing facilities by means of Bradley Washfountains and Showers has been growing rapidly throughout industry. Besides savings in space, installation costs and water consumption, Bradleys provide maximum washing facilities in the *most sanitary* manner.

In addition to the larger up-to-10 person Washfountains for general plant use, the two-person DUO with foot-control is fast becoming popular for the smaller clerical and executive washrooms.

Complete information on the Bradley line is found in our well illustrated Catalog 5204

BRADLEY WASHFOUNTAIN CO.
2273 W. Michigan St.
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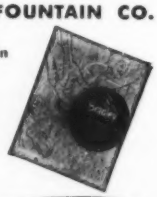

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BRADLEY washfountains

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such as filler materials, mandrels, wooden dies, hot bending, pipe- and tube-coiling and bending operations in the field are also discussed.

Safety Code

AMERICAN STANDARD CODE for Mechanical Power Transmission Apparatus, ASA B15.1-1953 Size 7¾ by 5¼ in. 47 pp; paper bound. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. Price $1.00.

THIS CODE deals with the guarding of all revolving and reciprocating parts of equipment used in the transmission of power. It involves shafting, pulleys, belt, rope, and chain drives, gears, chains, and so forth.

The information in the booklet can be used to advantage by the producer as well as user of machinery. The purchaser can also use it to help him in drawing purchase specifications.

Lead in Plumbing

LEAD WORK for Modern Plumbing. Size 7¾ by 5 in.; 164 pp; illustrated; plastic ring bound. Published by Lead Industries Assoc., 420 Lexington Avenue, New York 17, N. Y. Price $1.50.

LEAD IS one of the oldest plumbing materials in existence and still going strong. The Romans used it for water pipes and there were other users even before them. Today it is probably used more than ever with added refinements.

This handy book covers many facets of lead work that should be of interest not only to the craftsman but to others concerned with the use of this material. The text material is presented clearly and concisely covering tools, procedures and methods. The following are some of the main sections in the book: lead working tools; soldering with irons; wiping joints; making sheet lead pans and linings; installation details; and lead welding.

Tips on Spray Painting

SPRAY PAINTING MADE EASY. Size 9 by 6 in.; 33 pp including index; illustrated; paper bound. Published by The DeVilbiss Co., 300 Phillips Ave., Toledo, Ohio. Price 35 cents.

Despite the fact that the process of spray painting is used widely, the mechanics of it and the equipment involved are perhaps not as well known as they could be. Here is a booklet that should clear up a number of points on the subject.

It considers the methods of getting material to the gun and the mixing of the paint and air in the gun. This is followed by a discussion on spraying technique for working on different jobs. It also gives attention to the cleaning of the gun and equipment; masking methods; wall, woodwork, and home shop spraying.

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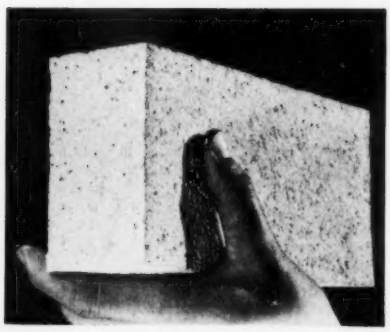
JOHNS-MANVILLE USES RUUD-MONEL SANIMASTER IN MANUFACTURING PROCESS!



Left: The Johns-Manville plant at Zelienople, Pa.
Above: Fire brick manufactured at Zelienople plant.

The Johns-Manville plant at Zelienople, Pa., manufactures insulating fire brick for heat-treating furnaces. Formerly, coal-fired boilers were used to heat water for the mixing operation. But coal heating proved costly, with temperature difficult to control. A more efficient method was needed.

An ideal solution was found in the Ruud-Monel two°temp Sanimaster Automatic Gas Water Heater. Two Sanimasters now provide 150 gallons of even-temperature hot water needed per hour. And at a great saving in fuel cost!

This new method assures consistency of the basic mixture, resulting in uniform drying schedules . . . another instance where the Ruud-Monel Sanimaster is the ideal solution in a manufacturing process.

The Ruud-Monel Sanimaster is the *only* self-contained water heater on the market that will supply both regular-hot and extra-hot water from one tank at one time.

In addition to the Ruud-Monel two° temp Sanimaster, Ruud offers a complete line of water heaters for domestic, commercial and industrial applications. For specifications and literature, write Department T-12.

MONEL—NATURE'S WONDER METAL

SANIMASTER'S tank is made of solid MONEL—the only metal that safely holds water at such high temperatures as 180°. And it will never rust! Ruud-Monel two°temp Sanimaster, with its exclusive long-life Monel tank, will give you sparkling clean hot water for years and years.

RUUD-MONEL two°temp Sanimaster

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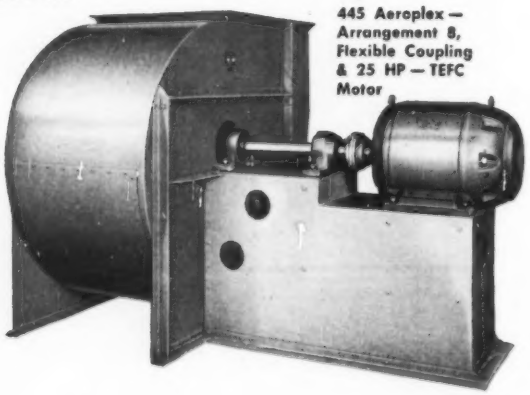
A typical example of combining these advantages is the forced draft fan shown here — supplied by BAYLEY to a leading aluminum producer.



445 Aeroplex — Arrangement 8, Flexible Coupling & 25 HP — TEFC Motor

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INDUSTRIAL FILMS

Wiring with Aluminum

LATEST IN THE "HOW-TO-DO-IT" series of films of the Aluminum Company of America is "Electrical Wiring with Alcoa Aluminum."

Prepared originally for electricians working on the erection of Alcoa's new Pittsburgh office building, the film deals almost entirely with the techniques of handling and joining in the installation of aluminum conduit, cable and wire.

The discussion of aluminum conduit covers cutting, reaming, threading, handling, and pulling cable. Compound use and preparation methods for joining wire and cable are explained and the four most frequently used types of connection for aluminum wire and cable—mechanical, loop joint, compression and welded joints—are described. Suggestions as to their proper uses are offered.

A pocket-size folder is available for distribution to viewers of the film, which is available through any Alcoa sales office or upon direct request to the Motion Picture Div., Aluminum Company of America, 818 Alcoa Building, Pittsburgh 19, Pa. Estimate of the potential audience should acccompany inquiries.

Copper in Construction

FIRST FILM OF ITS KIND, a 46-minute color picture entitled "Sheet Metal in Building Construction" documents the principles of sheet metal construction Revere Copper and Brass Incorporated recommends to architects, specification writers and sheet metal men generally. It was made under the auspices of the company's Research and Development Department.

The movie opens with a variety of shots of outstanding examples of copper roofs. The installations shown have withstood the tests of time and weather for many years.

The scene is then shifted to Revere's field laboratory in Rome, N. Y., where company engineers and technicians are shown testing various types of installations, both properly and improperly designed, as an aid in determining applications of correct principles of installation to roofs, copings, sidings, gutters and flashing.

Although the majority of the location shots showing a variety of roofs, copings, sidings, gutters and flashing depict sheet copper being formed and actually installed on the job, the principles illustrated apply to other sheet metals as well, and these also appear in the film.

Interested groups should request showings of the 16 mm film from the company at 230 Park Ave., New York 17, New York.

THIS IS THE MOTOR of a production grinder. Note dust and coolant on SEALTITE protecting lead wiring.

How to keep foul-up and corrosion out of your lead wiring

Use SEALTITE. Its tough outer cover resists all enemies of motor lead wiring.

You can spray your wiring with oil . . . douse it in water . . . cover it with dirt . . . expose it to corrosive fumes . . . even let salt spray and chemicals do their worst – *without fear of foul-up and corrosion* – IF you run it in SEALTITE* Electrical Conduit. A special outer cover takes them all in stride.

Yet tough as it is, SEALTITE is light and flexible. It installs easily in cramped spaces. It absorbs vibration—takes movement. It hugs motor contours. It looks neat.

*Trademark

Liquid-tight SEALTITE is the first conduit of its type to be approved by Underwriters' Laboratories, Inc. for use where exposed to moisture and mineral oils. (See N.E. Code, Art. 351.) For tight bends on machine tools and industrial equipment, use SEALTITE Type EF (Extra Flexible), which meets standards set by J. I. C.

Electrical Supply Houses stock both types in coils. Buy it this way; then cut without waste. Jobbers also stock liquid-tight fittings for use with SEALTITE.

SEALTITE

flexible, liquid-tight electrical conduit

an ANACONDA® product

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Please send me descriptive booklets on SEALTITE Electrical Wiring Conduit. 54171

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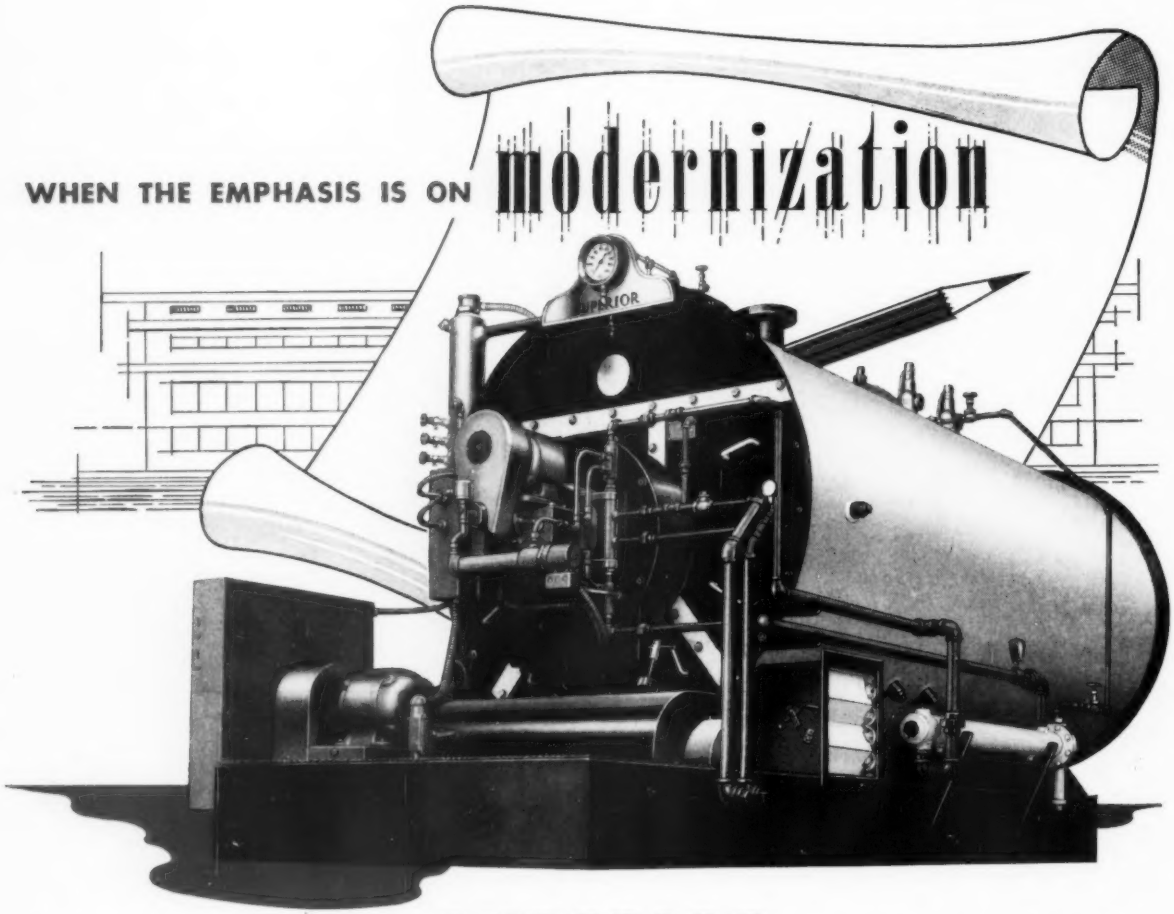
WHEN THE EMPHASIS IS ON **modernization**



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LET'S FACE IT!

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Installation is simplified for speed and economy . . . requiring no special foundation, no expensive chimney other than a vent for exhaust gases . . . puts steam where used, eliminating long steam lines. Compact design saves space and construction costs.

Fully automatic operation with any grade of oil or gas assures maximum fuel economy with minimum supervision. Ample heating surface (min. 5 sq. ft. per b.h.p.) assures operation at capacity without overfiring. Built-in induced draft makes boiler rooms cleaner, quieter, and safer.

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for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
STEAM GENERATORS

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(Continued from page 38)

ties of wrought aluminum alloy strip. A section of this booklet is devoted to technical data on five basic alloys offered, including fabricating characteristics, standard temper designations, physical and mechanical properties, weights, conversion factors, other data. Scovill Mfg. Co.

134 Aluminum Covering — A protective covering of lightweight corrugated aluminum for use over regular covering or insulating material is described in this illustrated folder. Protection offered, attractive appearance, permanency of the material are stressed. Smith Products.

135 Correction Chart for Rounds—This celluloid cylindrical correction chart is small enough to carry in your pocket. It indicates corrections to be added to hardness values obtained on cylindrical surfaces, when a comparison between the cylindrical hardness value and the hardness value of the same material tested flat is needed. Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

136 Copper Water Tube—Sixteen-pp Bulletin BC-1 gives application, dimensional information on three types of company's copper water tubes. Discusses packaging and soldering. Technical section gives design, installation data. Brass and Copper Tube Div., Triangle Conduit & Cable Co.

INSTRUMENTS AND CONTROLS

137 Instrumentation at Work — Newest edition of this company's magazine, Instrumentation, is now available to plant engineers. Included in this 48-pp issue are articles covering increased production in a textile mill, treatment of 40 million gal of water a day, test room control, recovery of hydrocarbons. Industrial Div., Minneapolis-Honeywell Regulator Co.

138 Switchboard Instruments — Bulletin GEC-218C, 24 pp, describes company's long-scale instrument lines. Gives principles of operation, characteristics and specifications. Prices and dimensions are provided. General Electric Co.

139 Electronics Equipment — Sixteen-pp Bulletin B-8093 describes application and operating range for surge comparison testers, portable balancers and vibrographs and magnetic amplifiers. Gives information on transformer cores and magnetic materials and alloys, also technical data. Westinghouse Electric Corp.

140 D-C Indicating Instruments—Eight-pp Bulletin GEC-978A describes portable d-c indicating instruments. Provides information on the applications, features, prices and performance of manufacturer's Type DP-11 and DP-12 instruments. General Electric Co.

141 Temperature Control Systems—Bulletin F-6149, 8 pp, on industrial process temperature control, aids in selection of sensing elements and their correct use. Explains and discusses the various types of systems, from two-position "on-off" to proportional position with automatic reset. Includes selection suggestions. Wheelco Instruments Div., Barber-Colman Co.

142 Flow Signal Transmitter — Bulletin 2583, 8 pp, describes company's heavy-duty pneumatic signal transmitter for measuring, indicating and controlling fluid flow and liquid level at operating pressures up to 1500 psi and pressure differentials up to 100 psi for steam generation and process control. Stresses design details which give transmitter a linear-flow characteristic without need of additional square root extractors in totaling. Hagan Corp.

143 General-Purpose Oscillograph — Twelve-pp Bulletin GEC-449B describes and gives pricing data on an oscillograph for use in investigation, design and testing of many types of machines. Tells how it makes simultaneous records of voltage, current, time, speed, pressure, strain and sound. Includes other electric instruments for industrial and central station use such as long-scale switchboard instruments, phasing-out voltmeter, Type AK hook-on instruments. General Electric Co.

144 Oscillator Controls — Bulletin 34-10 presents the Frahm oscillator control, described as a miniature tuning fork for use in an electronic oscillator to provide a stable output frequency. Tells how the control is built, explains its operation and illustrates a circuit suitable for most purposes. James G. Biddle Co.

145 Air-Flow Control—Application and installation ideas, suggested circuits for use of Detect-A-Flo, a device which controls or detects liquid level and air flow, are presented in this 16-pp illustrated bulletin. Discusses principle of operation, specifications, response curves on performance, operation and electrical characteristics, under the various conditions of use encountered. Fenwal Inc.

146 Venturi Tube—Company's Type VE venturi tube, a primary device used to produce pressure differentials from flowing liquids for actuating rate of flow meters, is discussed in this illustrated bulletin. Data shows how any low-velocity, low-pressure flow of liquids containing solids can be measured in connection with venturi meter. Simplex Valve & Meter Co.

LIGHTING

147 Outdoor Lighting Control—Two bulletins on multiple-circuit photo-electric control equipment for outdoor lighting, particularly street lighting, are announced. They are Bulletin GEC-1210 containing features and specifications, as well as information on installation and operation; and Bulletin GEA-5141B which discusses various outdoor lighting applications for the new equipment. General Electric Co.

148 Tower Lighting — Technical Data Bulletin 381-F, 20 pp, shows diagrammatically how to meet FCC requirements for lighting microwave and other relay towers. Lists kits of lighting equipment and controls together with complementary equipment required for the various heights of towers. Crouse-Hinds Co.

149 Fluorescent Lamp Ballast—Installation, use, application and selection of fluorescent lamp ballasts are discussed in two booklets. Eight-pp Bulletin GEC-963A gives specification charts for selection of ballasts; includes wiring diagrams, cross section dimensions. Bulletin GET-922F, 12-pp, describes lamps and starters, gives operating characteristics, installation suggestions for all types of ballast. Includes discussion on equipment for d-c operation of fluorescent lamps. General Electric Co.

HEATERS

150 Space Heater—Bulletin 550 describes company's "Parafio" oil-fired, warm-air space heater, available in capacities of 200,000 and 250,000 Btu per hour. Describes features including floating stainless-steel combustion chamber, high operating efficiency and flexibility of mounting. Dravo Corp.

151 Gas Unit Heaters—Twelve-pp Technical Bulletin 23-3 describes gas-fired unit heaters, including propeller fan and blower type heaters, ranging in capacity from 55,000 to 500,000 Btu per hour and burning all types of gas at the rated capacities. Includes capacity tables, roughing-in dimensions. United States Air Conditioning Corp.

January, 1954

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THIS MONTH'S LITERATURE OF MERIT covers rust prevention . . . pipe and fittings . . . electrical connections . . . packings . . . plant modernization

152 Guide to Rust Prevention—The 24-pp 1954 edition of this company's general catalog provides a treatise on rust prevention. Features 94 color chips of manufacturer's products and includes instructions for surface preparation and application of primers, short- and long-oil types, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings. Presents a restful color group of finishes for plant interiors; also describes special finishes. Rust-Oleum Corp.

153 Data for Pipe, Fittings—This 28-pp booklet provides engineering data tables for use with manufacturer's corrosion resistant pipe, tubing and welding fittings. Besides giving facts and formulas, it answers most frequent questions of pipe and tube users. Tables cover corrosion resistance of nickel alloys, chemical and physical properties of alloys, pipe flow data, fluid-flow-friction losses, ASTM specifications. Stainless Welded Products, Inc.

154 To Make Good Connections—Tips on making good connections with aluminum conductors are given in this little 20-pp booklet. Humorous illustrations and brief text cover application of compound, wire brushing, use of pressure, use of spacers, problem of galvanic corrosion, sealing, use of armor tape and other factors. Kaiser Aluminum & Chemical Sales, Inc.

155 Manual on Packings—Generously illustrated with photos and mechanical drawings, this 60-pp catalog is divided into three sections, the first covering development, standardization and types of hydraulic and pneumatic packings. Application data for cup, flange, U and V packings is provided. Importance of leather as a packings material is discussed in the second section, along with information on water-well cups, valve and special leathers. The third section is devoted to natural and synthetic rubber packings, and their properties and characteristics are evaluated. Information on special packings and oil seals included. Graton & Knight Co.

156 Planning to Modernize?—"Plant Modernization and Expansion," 16-pp, outlines step-by-step procedure for analyzing plant facilities to compute basic cost of program. Explains factors involved including: type, quantity and value of products to be manufactured; tools, equipment and machinery required; floor space needed for plant and production facilities. Tells how to determine quotas, products, product components and production facilities, and to prepare optimum layout. Walter Kidde Constructors, Inc.

VALVES, PIPING, FITTINGS

157 Solenoid Operated Valve—Eight-page Technical Bulletin W-7 describes solenoid operated valves which automatically open or close in response to time clock, pressure switch, manual switch or other impulse. Bulletin contains operating instructions, illustrated parts list and dimensions. Golden-Anderson Valve Specialty Co.

158 Pipe Data—Technical Data Card 138 A contains information on dimensions, weights, specifications, grades and analyses of seamless and welded carbon, alloy and stainless steel pipe. Gives pertinent data on six pipe size schedules and reference data to steels covered by ASTM and ASME piping specifications. Tubular Products Div., The Babcock & Wilcox Co.

159 Metal Expansion Bellows — Six-pp Bulletin 300 describes company's metal expansion bellows for conveying gas and liquids. Diagrams show advantages of welded-diaphragm construction in withstanding high temperature, vibration and corrosion. Titeflex, Inc.

160 Line Type Purifier—Bulletin 201 simplifies selection of purifiers by charts enabling a plant engineer to select the size of company's Hi-eF Purifier best suited for flow and pressure requirements of the job. Includes installation diagrams, tables of dimensions. The V. D. Anderson Co.

WELDING AND MACHINE SHOP EQUIPMENT

161 Welding Guide — The "DirectoRod Guide" is a 32-pp booklet of recommendations for 300 types of metal joining operations. Some 40 illustrations show practical applications and there are 12 pp of charts. Each of twelve sections deals with a specific base metal and at the end of each section is a chart listing the electrodes, alloys and fluxes which may be used. Eutectic Welding Alloys Corp.

162 For Arc Welding—Twelve-pp Tweco-log 9, covers manufacturer's line of electrode holders, ground clamps, cable connectors and cable accessories for arc welding. Gives specifications, consumer quantity prices, general information. Tweco Products Co.

163 Mounted Wheels—Eight-pp Catalog 30, describing manufacturer's porcelain and Resinoid bonded mounted wheels, is a guide for selecting the proper shape for the job. Illustrates "A" and "B" grinding shapes full size. Contains illustrations and listings of abrasive cartridge and small grinding wheel mandrels and rubber polishing wheels. The Metal Removal Co.

164 For Precision Measuring—Form 51-810 is a 36-pp catalog featuring a line of lightweight, easily handled micrometers with tubular, vacuum-sealed frame. Also describes other micrometers, dial indicators, height gages, comparators, depth gages. Fully illustrated, and indexed, includes sizes. The DoAll Co.

165 Power Shears—Sixteen-pp illustrated Bulletin 2011-E gives dimensions and specifications for 31 different sizes of Steelweld pivoted-blade power shears, ranging from 6 ft by 10 gage to 12 ft by 1 in. capacity. Lists larger shears for cutting steel to 24 ft by ¼ in. The Cleveland Crane & Engineering Co.

SAFETY EQUIPMENT

166 Safety Devices—Bulletin C-54 lists prices of safety devices for steam and hot water boilers and hot water tanks. Gives information on company's boiler feeders, low water cut-offs, pump controls and pressure and temperature relief valves. Features a service recommendation chart. McDonnell & Miller, Inc.

167 Safety, Relief Valves — Sixteen-pp Catalog Section E gives ordering and application information on safety and relief valves for liquid and gas service. Also presents vacuum breakers and vacuum regulators. Includes dimensions, service ranges. Also gives liquid and air capacities. Associated Valve & Engineering Co.

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168 For Lower Cost Insurance — How yearly insurance costs can be cut by use of company's Saveall spray sprinkler, which is designed to detect and stop fires automatically, is shown in this 14-pp bulletin. Illustrates sprinkler with a fusible element of solid organic chemical and maintenance devices. Globe Automatic Sprinkler Co.

OTHER EQUIPMENT

169 Metal Hose—Catalog 130R, 32 pp, shows all types of Flexon metal hose, including company's Rex-Weld corrugated metal convoluted hose types, Rex-Flex stainless steel flexible metal hose, and special purpose assemblies. Features heavy duty stainless steel hose; gives coupling types and installation information. Flexonics Corp.

170 Electronic Computer—Six-pp Form TM 842 gives details on an electronic punched card computer which has application in production control, engineering, research and other work. Pictures typical cards, tells how computer can handle complicated mathematical computations. Discusses special advantages of the computer, stresses simplicity and versatility. Remington Rand Inc.

171 Industrial Rolls—Catalog 48, 48 pp, on rubber, metal, wood and plastic rolls, has an appendix of tear-out dimension sheets for supplying specifications on rolls, fulling-mill lags and textile machinery reels. Describes teflon-covered rolls for processes where adhesive materials must be prevented from sticking to the rolls. Illustrates solid wood rolls, metal and wood guides, carrier rolls, wormed rolls, also friction, squeeze and press rolls, and rubber-covered, chromium-plated and stainless steel types. Discusses care of wood and rubber rolls. Rodney Hunt Machine Co.

172 Vaneaxial Blowers — Direct-drive vaneaxial blowers, three types of belt-drive blowers and a portable blower for exhausting fumes from tanks are described in 16-pp Bulletin A-110. Includes dimension drawings and figures, also air delivery tables. Hartzell Propeller Fan Co.

173 Vapor Degreasing — This 34-pp manual discusses vapor degreasing comprehensively from degreasing processes to maintenance and trouble-shooting. Illustrated with diagrams and cutaway photos, it describes designs of degreasing equipment, installation, operating instructions and actual cleaning of work. Discusses solvents, also types, usage and operation of recovery stills. Circo Equipment Co.

174 For Crane Cabs—Air conditioning and removal of dust and dirt from air in crane cabs by means of manufacturer's coolers and conditioners is described and illustrated in 24-pp Bulletin 1301. Tells where to use horizontal, vertical and split models. Describes wool bag filter for filtering of fine dust, metallic or exhaust fumes. Dravo Corp.

175 Improved Thawing Pits — Bulletin 1041, on prefabricated oil- or gas-fired thawing pits, shows how these pits solve the winter problem of thawing frozen railroad hopper cars of coal and other materials by means of radiant heat. Stresses faster thawing, low fuel consumption, other advantages. Gives specifications of a standard duty unit. Hauck Mfg. Co.

176 Single Stage Turbine—Six-pp Bulletin 4206 contains design features, dimensions and performance data on the HCB single stage turbine with maximum operating conditions of pressures to 300 psig, temperature to 550 F, and speed to 4000 rpm. Presents two-pp cutaway diagram of turbine listing 18 design features. De Laval Steam Turbine Co.

177 ABC's of Dryness—Eight-pp Bulletin 16.0.081 presents packaged dehydration units for efficient drying of air or other gases. Tells what these dryers can do, what they will remove dryness from and where they are recommended for use. Explains drying operation; discusses adsorbents and equipment utilized, giving construction details and sizes offered. Typical arrangements for both full-stream and split-stream reactivation are diagrammed, and selection information included. Equipment Div., J. F. Pritchard & Co.

178 Electrical Precipitators—Plant engineers planning to buy precipitators for recovering industial dusts and mists will find useful information in 40-pp illustrated booklet C-103. Summarizes latest advancements in company's equipment, outlines various types of electrode designs, shell constructions and mechanical rectifier systems and gives information on combination mechanical-electrical recovery systems (CMP units). Lists types of precipitators, compares mechanical and electronic tube rectifiers and gives useful information on dust collection problems. Western Precipitation Corp.

179 Improved Trenchers—Three of this company's Ditch-Witch trenchers are described and pictured in this 8-pp bulletin. They include a lightweight model for electric cable installation and small pipe, a general-purpose model available with open or closed buckets, and a larger model with hydraulic torque drive. Includes application suggestions, specifications. The Charles Machine Works.

180 For Industrial Filtration—Bulletin A-943, 8 pp, gives essential features and applications of manufacturer's 10 basic types of industrial filtration equipment . . . filters, flotation units, vacuum stills, magnetic separators, and oil conditioners. Covers equipment designed to reclaim and repurify oils, coolants, solvents and industrial waters by removing solids, solubles and volatile contaminants on a continuous automatic basis. Industrial Filtration Div., U. S. Hoffman Machinery Corp.

DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 37-38 and 185-186.

MECHANICAL POWER TRANSMISSION

201 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

202 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

203 Sprockets, Roller Chain — Bulletin A-624, 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. A page devoted to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Co.

204 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

205 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

206 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

207 Coupling or Converter—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters should be used, and why, furnishing a source of facts on non-technical terminology. Covers meaning and characteristics of torque and effect on driving and driven equipment. Twin Disc Clutch Co.

ELECTRICAL

208 Motor-Generator Reference Book — Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their application and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control. Allis-Chalmers Mfg. Co.

209 Motor Controls—In this 28-pp bulletin the most important items in company's line of standard motor control apparatus for all industries are presented. Controls, starters and accessories are described and applications listed. Allen-Bradley Co.

210 Variable Speed Motors — Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls, etc. U. S. Electrical Motors, Inc.

211 Weatherized Motors—Six-pp Bulletin 400 describes company's All-Weather integral motors for industrial use. These have full height protection, through ventilation, one-piece steel shell, interchangeability of end head. Robbins & Myers, Inc.

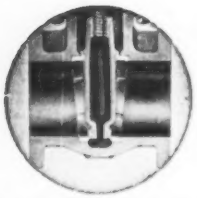
212 Productive Maintenance — Publication GED-1691 is a pocket-size 104-pp source of information of value to plant engineers who want to get more production from their present motors, generators and control equipment. Besides general maintenance suggestions, the booklet contains trouble shooting charts and recommended renewal parts guides. Also provides wire and cable data and includes a section of formulas and other data pertaining to motors and generators. General Electric Co.

213 The Answers on Wiring—"20 Questions and 20 Answers on Safety Metal Wiring" describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes weights and lengths, as well as a partial list of users included. General Cable Corp.

214 Bus Duct Manual—Booklet B-4272A 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct or a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

215 Power Distribution Feeders—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction engineering, application data. Trumbull Dept., General Electric Co.

216 Power and Control Cables—Sixty-pp Catalog 24 describes typical power and



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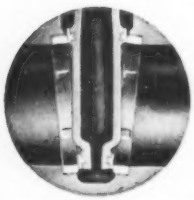

Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

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iron body gate valves

with screwed or flanged ends

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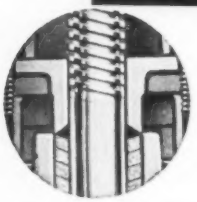

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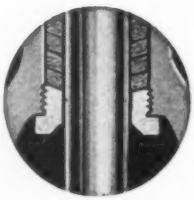
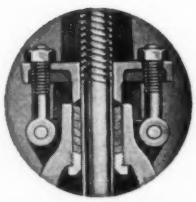


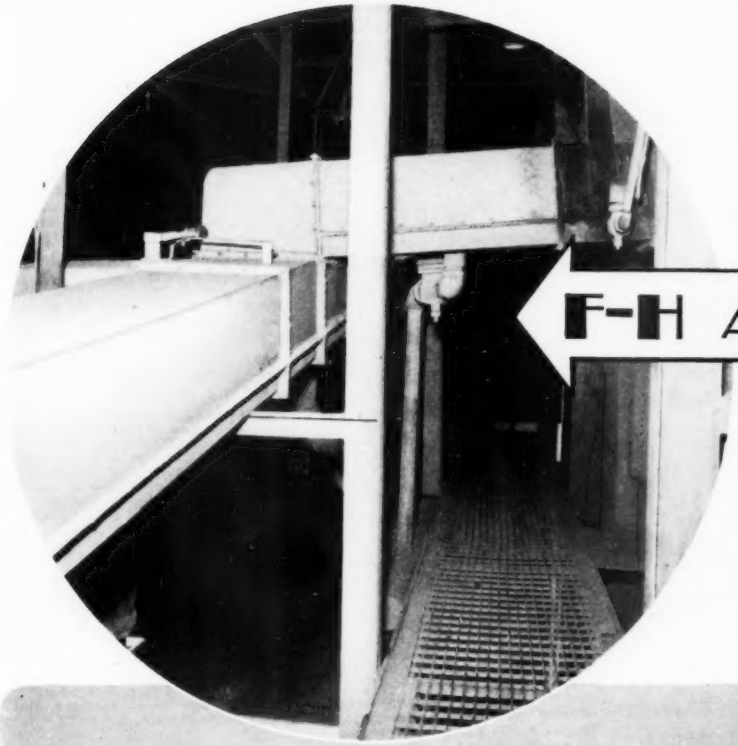
Bronze Back-Seat Bushings in bonnets of OS&Y valves.

Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

For more facts circle 621 on Reply Card



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The many convenient, money-saving features of the F-H Airslide make it almost indispensible in plants, processing gypsum, soda ash, fly ash, barytes, bentonite, Portland cement, flour, ground ores, alumina, catalysts, silica, phosphates, talc, resins, detergents and soap powders, magnesite; or any other dry, pulverized material which can be fluidized with low-pressure air, and economically conveyed from one location to another.

The adaptability of the Airslide allows it to be worked into existing plant and production setups with little, if any, rearranging of equipment. Straight or curved sections of the Airslide can be suspended overhead, attached to wall space, or effectively placed out of the way along the floor. The Airslide can be applied to car, truck, ship loading and unloading; in-plant conveying from pulverizing mills, dust collectors, screws, separators, bins, and silos.

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Fuller Company is the exclusive manufacturer of air-gravity conveyors, except for use in motor vehicles, under Huron Portland Cement Company U. S. Patent Nos. 2, 316, 814, 2, 517, 837, 2, 527, 394, 2, 527, 455, 2, 527, 466, 2, 257, 499, 2, 589, 968, and Patents Pending.

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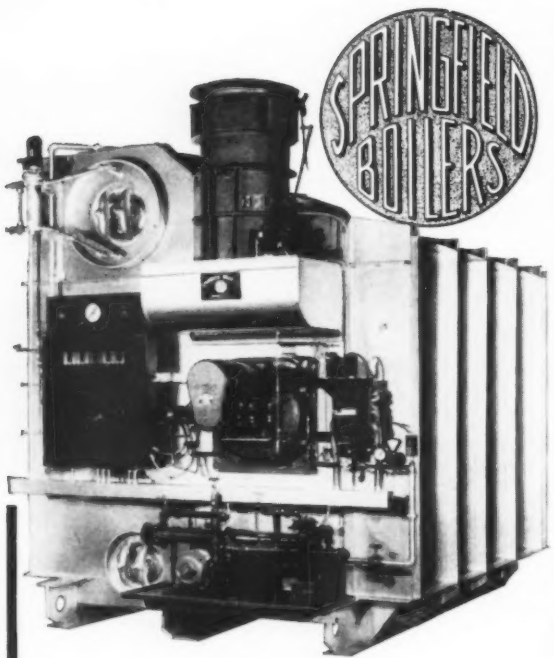
Ahead in Design! SPRINGFIELD WATER TUBE PACKAGE BOILERS



1. Rugged 2-Drum, Bent Tube *"Power Plant Type"* design. No headers, no handholes, no wasted weight. Unrestricted circulation.

2. Complete "6 wall" furnace cooling for greatest capacity. Permits higher heat release rates with lower actual "heat loading" of tubes.

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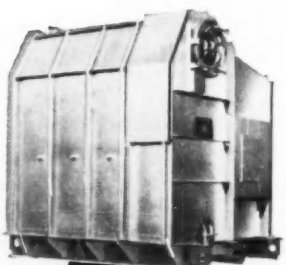

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DATA FILE

(Begins on page 187)

control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

217 Plug-In Power—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

218 Circuit Breaker Reference Data—Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

219 Industrial Truck Batteries—Bulletin IT-520 covers company's complete line of industrial truck batteries and gives details such as dimensions, wet and dry weights, types of containers, and capacities at the 6- and 8-hr rate. C&D Batteries, Inc.

220 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. Lists applications for these starters and pictures enclosures. Square D Co.

221 What You Should Know About Circuit Beakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

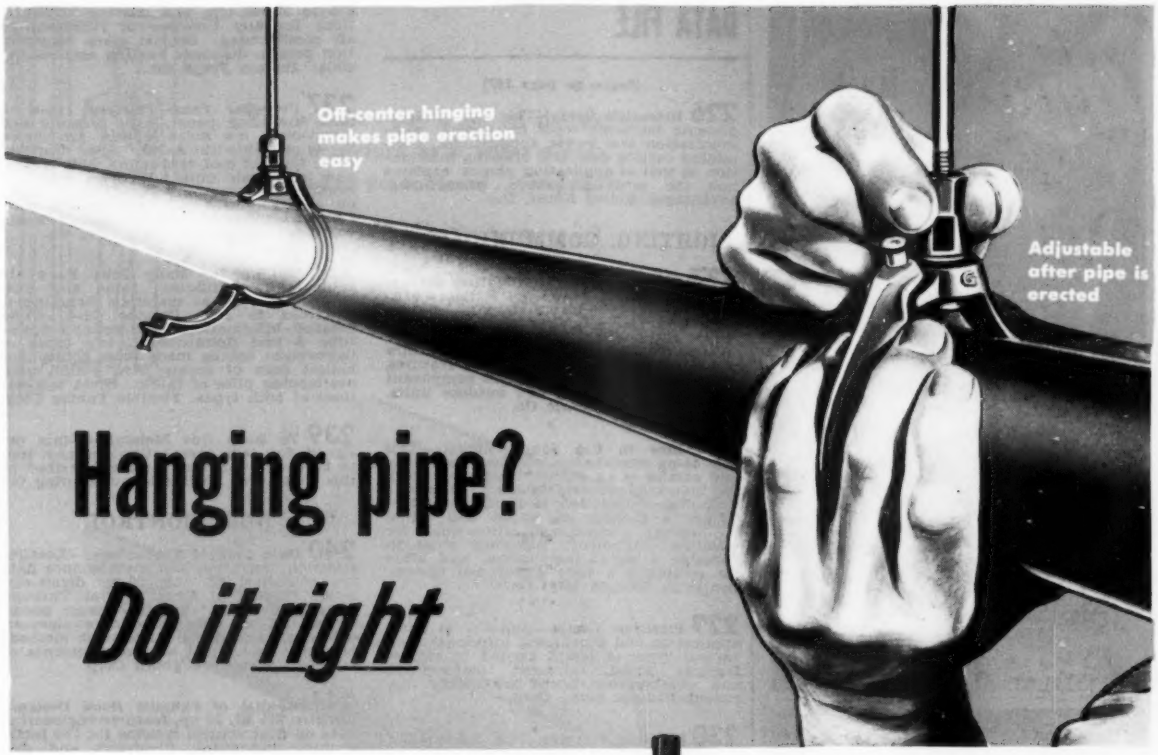
222 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls is given. Westinghouse Electric Corp.

223 Snap Action Switches—Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

The two Reader Service Cards on pages 37 and 185 are easy to use and need no postage. Just circle the item number of catalogs wanted.

224 Flexible Cords—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

225 Electrical Equipment for Cranes—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.



Hanging pipe?

Do it right

There's a stock Grinnell hanger for every piping requirement

SAVE MONEY ON ASSEMBLY. Cut installation time, get better, stronger installations, with Grinnell adjustable pipe hangers and supports.

NO SAG . . . NO WATER TRAP. Grinnell hangers permit adjustment after pipe is installed. This makes it possible to prevent sagging pipe and water traps, and assures positive drainage for the entire system.

FOR EVERY INSTALLATION. There is a stock Grinnell hanger for every need from simple water pipe to high pressure, high temperature steam line. Where necessary, there is a hanger to compensate for thermal movement.

PLAY SAFE. Don't waste time or take chances on inadequate pipe hangers and supports. All Grinnell hangers comply with rigid piping code requirements.

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(Split Ring Type)

- Hinging of ring is off-center. This provides sufficient seating to hold pipe before closing ring. Wedge-type pin is loosely but inseparably cast into the hinged section for fastening after pipe is in place.
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- When weight is returned, patented swivel shank locks automatically, preventing change of adjustment due to vibration. Wire retaining ring keeps swivel shank and pipe ring or yoke from separating, makes assembly a single unit.
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Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

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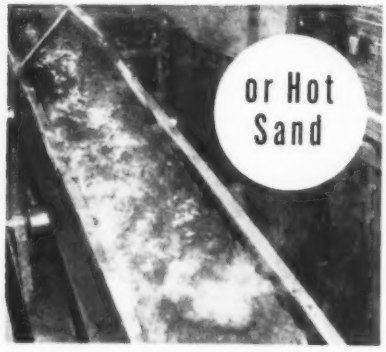

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DATA FILE

(Begins on page 187)

226 Retractile Cords—This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos, explains how the cords are made, where used, advantages. Koiled Kords, Inc.

LIGHTING, COMMUNICATION

227 Selection Data on Lighting Fixture Hangers—Catalog 50, 80 pp, contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

228 How to Use Sound Signals—This new 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a code signal call system. Benjamin Electric Mfg. Co.

229 Precision Lamps—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

230 Lighting Fixtures—Full information on company's fluorescent lighting fixtures designed for efficient industrial lighting and reduced maintenance is provided in Form OD-568. Day-Brite Lighting Inc.

VENTILATING AND AIR CONDITIONING

231 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water steam heating. Clarage Fan Co.

232 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt — this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

233 Air Conditioning Book, Heating — Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

234 Vaneaxial Fans—Bulletin J-611 is a 16-pp booklet presenting company's Axivane Series 1000 fans. Explains advantages afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia., volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

235 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

236 Air Conditioning Cabinets — Engineering Bulletin 3703A, 40 pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling coils. Buffalo Forge Co.

237 Propeller Fans—Thirteen types of fans, including panel, high pressure and direct-drive low noise models, are shown in 40-pp Bulletin A-109. Also describes three types of roof ventilators, unit heaters and intake air units. Includes specifications, dimensions and performance figures on all equipment, also engineering data. Discusses corrosion-resistant materials and coatings. Hartzell Propeller Fan Co.

238 Tubing for Many Jobs—Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube R, two types of lightweight tubing made from continuous helical coils of spring wire wound with overlapping plies of fabric. Gives applications of both types. Flexible Tubing Corp.

239 To Keep Out Moisture—Vents designed for easy installation on any roof to keep out wet, foul air are described in this literature. Muckle Manufacturing Co.

DUST CONTROL

240 Dust Control Technology — Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

241 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

242 Dust Control—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

243 Dust Collectors—Operation Construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

244 Improved Dust Filters—Sixteen-pp Bulletin 528-R gives information on continuous-automatic dust filters that can be furnished or unhoused for use on pressure or vacuum. Explains principle of cleaning the filter cloth with high pressure reverse jet air, and tells where these filters are being used. Provides comparative test data on these and other type filters; discusses industrial dust control service offered and diagrams some installations. Self-adjusting blow rings furnished with these filters are described in detail. The Day Co.

VIBRATION CONTROL

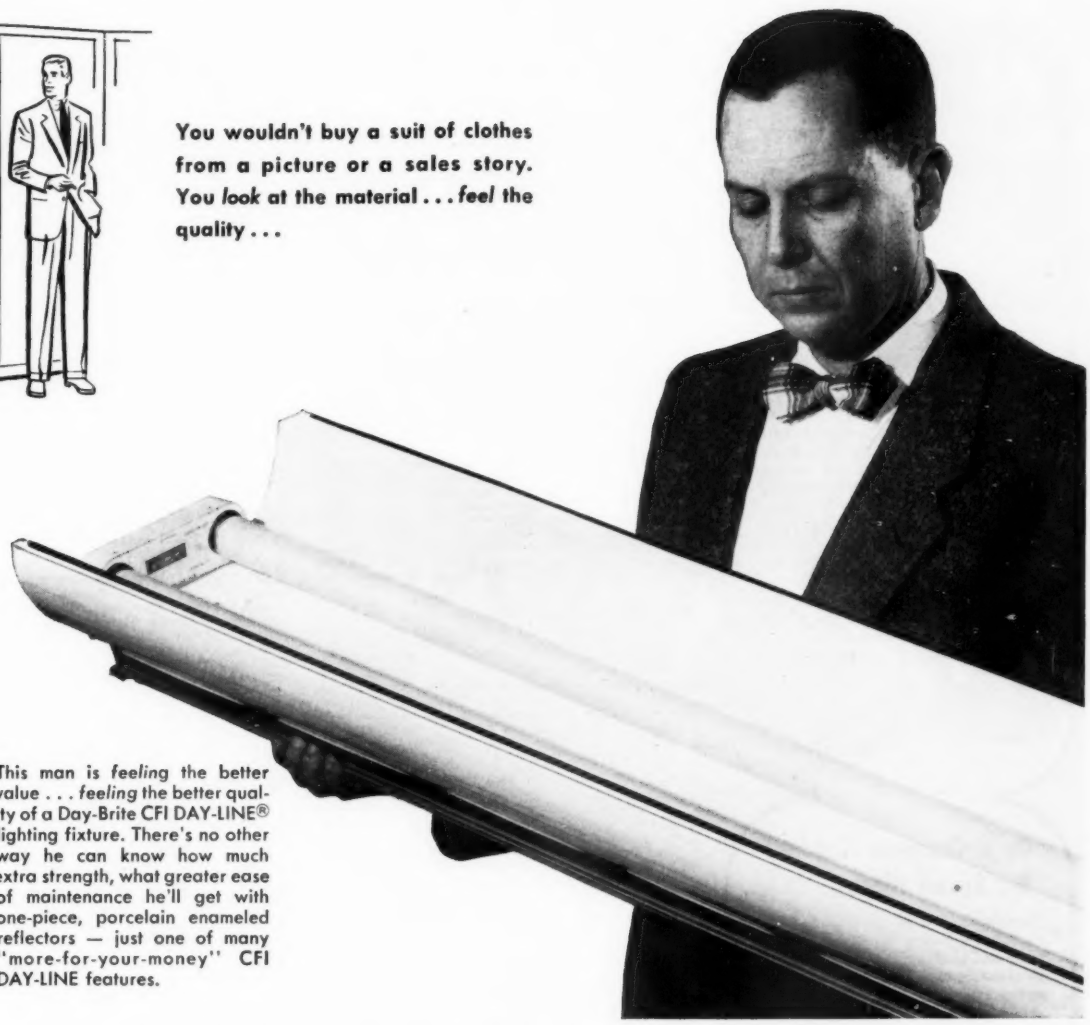
245 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discusses advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co.

246 Simplified Isolation—A simplified method of machine isolation which utilizes pads and cement is described in this small folder. Explains how it reduces maintenance cost. The Felters Co.

CONSTRUCTION

247 Glass Block Fenestration—The natural ventilation characteristics of glass block fenestration are presented in this

You wouldn't buy a suit of clothes from a picture or a sales story. You *look* at the material . . . *feel* the quality . . .



This man is *feeling* the better value . . . *feeling* the better quality of a Day-Brite CFI DAY-LINE® lighting fixture. There's no other way he can know how much extra strength, what greater ease of maintenance he'll get with one-piece, porcelain enameled reflectors — just one of many "more-for-your-money" CFI DAY-LINE features.

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when you buy lighting fixtures

Buy lighting fixtures like you buy a suit of clothes. Look at them yourself . . . feel the value . . . feel the quality . . . feel the difference you can't always find in the sales stories.

Pictures, catalogs and sales stories are excellent ways to bring competitive lines of lighting fixtures to your attention.

But when you're ready to invest your money, *don't buy until you handle the fixtures yourself.* Don't buy until you're satisfied by your own inspection which fixture is *your* best buy.

We expect you to test the CFI DAY-LINE or any other Day-Brite fixture you're considering for plant lighting in exactly that way. We know from experience your judgment is the very best Day-Brite sales story we have.

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47

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GIVES YOU FASTER, CHEAPER MAINTENANCE

Either a Portable Unit to Clean Structures...

Pangborn Blast Cleaning Machine—Cleans tanks, bridges, buildings, and other structures quickly and economically. Ideal for maintenance and other jobs, such as removal of dirt, scale, rust, etc. preparatory to painting. Six sizes, stationary or portable, from . . . **$188** and up.

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Pangborn Blast Cabinet—Saves time and money in cleaning small metal parts . . . removing rust, scale, grime, old paint, etc. Produces smooth, clean surfaces on pieces up to 60" x 35" in size. Models from . . . **$319** and up.

Pangborn Unit Dust Collectors—Trap dust at the source. Minimize maintenance, allow reclamation of valuable material . . . **$286** and up.

Pangborn Hydro-Finish Cabinets—Remove directional grinding lines, hold tolerances to .0001". Reduce further finishing of tools, molds, dies . . . **$1410** and up.

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Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

Pangborn

BLAST CLEANS CHEAPER

For more facts circle 627 on Reply Card

DATA FILE

(Begins on page 187)

illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft and ventilation below window sill. Test data is summarized and recommendations included. Although test was conducted on glass block fenestration in school buildings, the information will be of interest to those concerned with industrial applications of glass block. Kimble Glass Co.

248 Heat Absorbing Glass—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating costs. Mississippi Glass Co.

249 How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this plastic sheet. Plastic Dept., Rohm & Haas Co.

250 Industrial Steel Windows—Planned to offer comprehensive easy-to-find data, this 24-pp catalog gives descriptions, specifications, sizes, uses and advantages of Fenestra pivoted windows, commercial projected windows, and security windows used separately and in combination, also continuous windows used mainly for top-lighting in monitor and sawtooth roof construction. Detroit Steel Products Co.

251 Translucent Structural Panels—Bulletin 533, 12 pp, describes Resolite, a translucent structural material, corrugated or flat, molded of thermosetting polyester resins reinforced with woven glass fibers. Illustrates use of Resolite in partitioning, skylighting and decorating installations. Provides standard sheet specifications, general information on colors, weights, light transmission and thicknesses. Resolite Corp.

252 How Hardboards Improve Methods—Twelve-pp Form 5202, on production economies in plant maintenance, materials handling and processing, enumerates applications and specifies types and thicknesses of company's Presdwood for specific purposes. Lists 28 advantages of Presdwood, describes its use in architectural applications, bins, utility boards, cabinetwork, containers, booths and ventilators, work surfaces. Masonite Corp.

254 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Alan Wood Steel Co.

255 Flooring Guide—Plant engineers interested in specifying resilient tile flooring will find valuable information in Form 107. Tells what each type of resilient tile is recommended, and not recommended for. Specific information is given for asphalt tile, cork tile, rubber and grease-proof tiles. Kentile, Inc.

256 Heavy-Duty Flooring—An emery aggregate flooring for heavy duty use is discussed in 8-pp Bulletin 653. Gives test data on this flooring. Describes safety features, improved trucking, heat resistance and other advantages. Walter Maguire Co.

MAINTENANCE

257 Maintenance Manual — "Over the Rough Spots" is a 48-pp pocket size booklet giving the answer to practically every repair or building maintenance problem. Tells how to patch holes and resurface floors, how to prevent water seepage in underground foundations, repair leaky roofs, preserve concrete or wood surfaces, protect structural steel from rusting, and gives many time and labor saving methods. Generously illustrated. Stonhard Co.

258 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

259 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions, a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corrosive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

260 One-Coat Insulation — This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

261 Protective Paints—Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for wood, metal surfaces. Cellulose Products Dept., Hercules Powder Co.

262 Blower-Suction Cleaner—Data on a portable combination blower-suction cleaner for cleaning machinery, motors, stock bins is offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

263 Coatings for Chemical Industry — Advantages and use of synthetic resin-base coatings in the chemical industry are described in this 8-pp brochure. Presents 16 industrial case histories. Specific applications of coatings based on Bakelite and Vinylite resins described include tank cars, oil pipe, acid tanks, sewage disposal plant, shipping containers, plating rack and steel tubing. Also included is tabulation of effects of various chemicals on vinyl resin-base coatings. Bakelite Co., Div., Union Carbide and Carbon Corp.

See pages 37-38 and 185-186 for postage-free mailing cards. Use them to ask for bulletins — just circle item number of all those wanted.

264 Iron Cement Handbook — This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

265 Building Maintenance—Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

266 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, work, tile, linoleum, mastic wood. West Disinfecting Co.

267 Floor Maintenance Buyers Guide — Brief, but practical application details on

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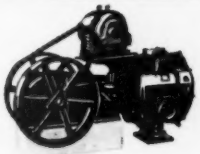
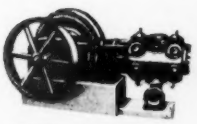
provide maximum efficiency in a WIDE RANGE OF APPLICATIONS

. . . with unusual flexibility of drive and cylinder arrangements



OVERHEAD MOTOR



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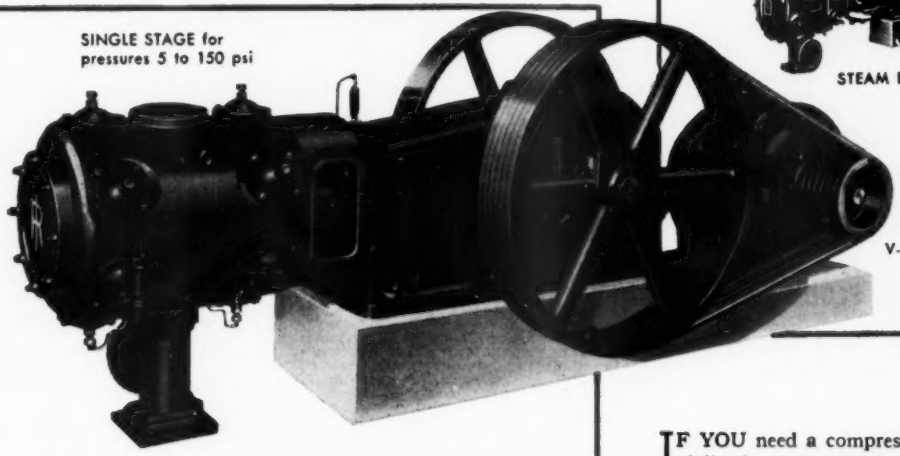
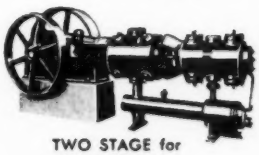
STEAM DRIVE

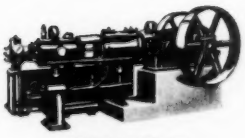
SINGLE STAGE for pressures 5 to 150 psi



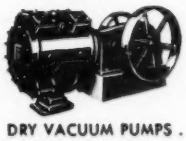
V-BELT DRIVE



TWO STAGE for 150 to 500 psi



THREE STAGE for 500 to 2500 psi



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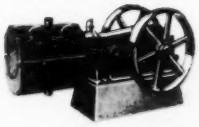
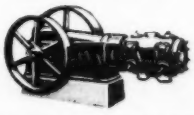


STEAM-PRESSURE BOOSTERS



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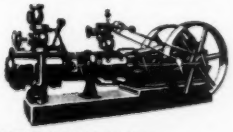

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- For capacities requiring from 5 to 125 horsepower. (Six frame sizes are available.)
- For continuous full-load operation day after day, week after week.
- For handling poisonous, inflammable, or other gases where leakage must be avoided.
- Where compressed air or gases must be free of all traces of oil. (Type NL cylinders require no oil, glycerine, grease or water for lubrication.)
- Where a future change in pressure conditions may call for a change in cylinder sizes.
- Where power cost is an important factor.
- To act as an economical standby unit for larger compressors whose full capacity is not required at all times.

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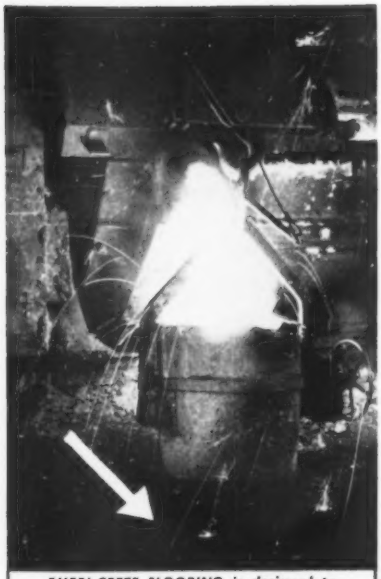

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We'll be in Chicago because we want to talk to you about *heavy-duty* and show you why EMERI-CRETE FLOORING, because it is *designed* for the job, can save you maintenance and production dollars *year in* and *year out*.

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DATA FILE

(Begins on page 187)

floor machines and accessories and a wide range of floor cleansers, waxes and other preparations are presented in this illustrated bulletin. Includes packaging information. Finnell System, Inc.

268 **Floor Scarifier** — Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. G. H. Tennant Co.

WIRE ROPE, SLINGS

269 **To Keep Wire Rope at Work**—Form 3547 is an 82-pp handbook titled "Here's How to Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Divs., American Chain & Cable Co., Inc.

270 **Wire Rope, How to Use It**—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. Also presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

271 **Sling Handbook and Riggers Manual** —In the sling handbook section of this 48-pp book, 11 sling types are illustrated and their dimensions, weights and safe working loads given. Illustrations of sling uses accompany factual data. Also pictured and detailed are sling fittings. Information on care of slings, data on braided wire fabric and directions on splicing braided wire sling fabric included. The riggers manual gives detailed instruction on splicing, and includes data on efficiencies of wire rope attachments and directions for attaching sockets or ferrules. Shows signals for cranes. Union Wire Rope Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

272 **For Quick Valve Selection**—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

273 **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

274 **Valves and Fittings**—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

275 **Reducing Valve Engineering Data**—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straight-line flow, tight closing. A. W. Cash Co.

276 **Lubricated Plug Valves**—Revised Catalog PV-2, 12 pp, presents steel and semi-steel valves designed to offer quick

THE HOIST WITH
fingertip control

Here is the most accurately controllable hoist ever devised . . .

KELLER Air Hoist

It is operated by an air valve that you can "crack" as little or as much as you like—from the barest creep to 17 fpm full speed, or any speed between.

Positive displacement piston-type air motors assure positive movement up or down. Centrifugal brake holds load immovable in any position.

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- Can't Burn Out, even when stalled
- Light Weight—1,000 lb air hoist weighs only 30 lb
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Scott Wipers are disposable. A thrown-away wiper carries harmful liquids and metal chips with it, thus protecting the workers from major causes of crippling dermatitis.

Within just a few short months, Scott Industrial Wipers have taken hold *fast*. More and more key men are finding that industrial wiping can be scientific—a regular phase of production.

These strong, absorbent Scott Wipers are designed for almost any wiping job. They are uniform in size, color, and absorbency. One Scott Industrial Wiper can be used several times before being thrown away.

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Experience shows that it will be to your advantage to let us make a survey of your individual requirements to see how Scott Industrial Wipers can best fit into your operation. For more information, fill out this coupon or contact your local Scott distributor.

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Clarage Fan Co.	National Airoil Burner Co., Inc.
Cleaver-Brooks Co.	National Conveyors Co., Inc.
Cochrane Corp.	Owens-Corning Fiberglas Corp.
Combustion Engineering-Superheater, Inc.	Permutit Co.
Consolidated Chimney Co.	Reznor Mfg. Co.
Continental Chimney Co.	Schaub, F. H., Engineering Co.
Cutshall, J. M., and Son	Springfield Boiler Co.
Cyclotherm Div., U. S. Radiator Corp.	Trane Co.
Dravo Corp.	United Conveyor Corp.
Filtrine Mfg. Co.	Water Cooling Equipment Co.
Graver Water Conditioning Co.	Westinghouse Electric Corp., Sturtevant Div.
Grinnell Co., Inc. Unit Heaters Fire Protection	Wing, L. J., Mfg. Co.
	Worthington Corp.
	Yarnall-Waring Co.

In other sections of the File you will find additional catalogs containing useful information on a wide range of products used in the maintenance of all plant facilities.

Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street, New York 18, N. Y.

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DATA FILE

(Begins on page 187)

shut-off of erosive or corrosive fluids. Explains advantages of the lubricated tapered plug design of these valves and pictures single gland, screwed gland, and bolted gland types. Also shows replacement parts and accessories for these valves. The William Powell Co.

277 Valves for Processing—General Catalog 1500 B, 20 pp, describes in detail the operation and performance of all of company's single seated valves—the Domotor, electro-pneumatic, handwheel and combination models. Optional assemblies for specialized applications are shown. Application information, operating characteristics given. The Annin Co.

278 Valve Maintenance Guide—"Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding. Jenkins Bros.

279 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

280 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

281 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

282 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

"Since we're going to be working together like this, Johnson, wou'd you be offended if I bought you a jar of underarm deodorant?"

283 Unions and Fittings—Twelve-pp Catalog 50 covers manufacturer's line of unions of all types, elbows, tees and fittings. Dart Union Co.

284 Steel Unions—This catalog sheet describes and pictures several types of steel unions, telling applications of each and listing sizes, prices. Clayton Mark & Co.

285 Expansion Joint Design Guide—Bulletin 135, 24-pp, contains engineering application and selection data on pipeline expansion joints. The guide features a discussion of the types of expansion joints available and kinds of pipeline motion solved by them. Also covered are expansion joint design considerations and installation instructions. Includes schematic piping layout. Flexonics Corp.

286 Welding Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

287 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

288 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commercial steel pipe. Tube Turns, Inc.

289 Handbook on Fittings, Flanges—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

290 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corrufiex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

291 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

292 Wrought Iron for Piping—This 32-pp booklet covers commonly used pipe materials and method of selecting them for specific types of service in modern building construction. Discusses wrought iron, cast iron and steel pipe, also copper and brass pipe, and the factors entering into the relative costs of piping materials. Pipe selection is treated, with emphasis on corrosion resistance. A. M. Byers Co.

PUMPS, COMPRESSORS

293 Installing a Pump—Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

294 Pump Service Manual—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings

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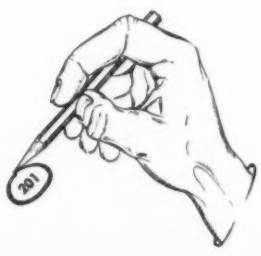

DATA FILE

(Begins on page 187)

and parts lists are provided, also high and low capacity steam consumption curves, general information on water, properties of steam. Warren Steam Pump Co., Inc.

295 How to Solve Pumping Problems—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

296 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

297 Cradle-Mounted Pumps—Sixteen-pp Form 7223, covering general purpose centrifugal pumps of the cradle-mounted type, presents five basic groups and 17 corresponding pump types, their capacities, horsepower ratings and uses. Includes dimensions and a table of performance under 60 cycle use. Ingersoll-Rand Co.

298 Hydraulic Pumps—Eight-pp Bulletin DP-300 gives features, selection data for company's dual-vane hydraulic pumps. Illustrations include drawings, cut-away photos and performance data charts. Dudco Div., New York Air Brake Co.

299 Multi-Stage Compressors—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centifugal compressor applications. Clark Bros. Co., Inc.

300 Air Compressor Selection Data—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described. Westinghouse Air Brake Co.

301 Centrifugal Compressors—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

BOILERS, GENERATORS

302 Packaged Boilers—This 16-pp illustrated catalog describes manufacturer's new Type VP package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 30,000 lb per hour. Space requirements are shown in a table along with typical specifications. Combustion Engineering, Inc.

303 Steam Generators—Data and specifications for completely plant assembled water-tube steam generators are contained in this 8-pp bulletin. They cover nine sizes from 5,300 to 33,000 lb steam per hour and for pressures up to 400 psi. These units are designed for fully automatic firing with oil, gas, or stoker-fired coal. Superior Combustion Industries, Inc.

304 How Much for Steam—This is a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas,

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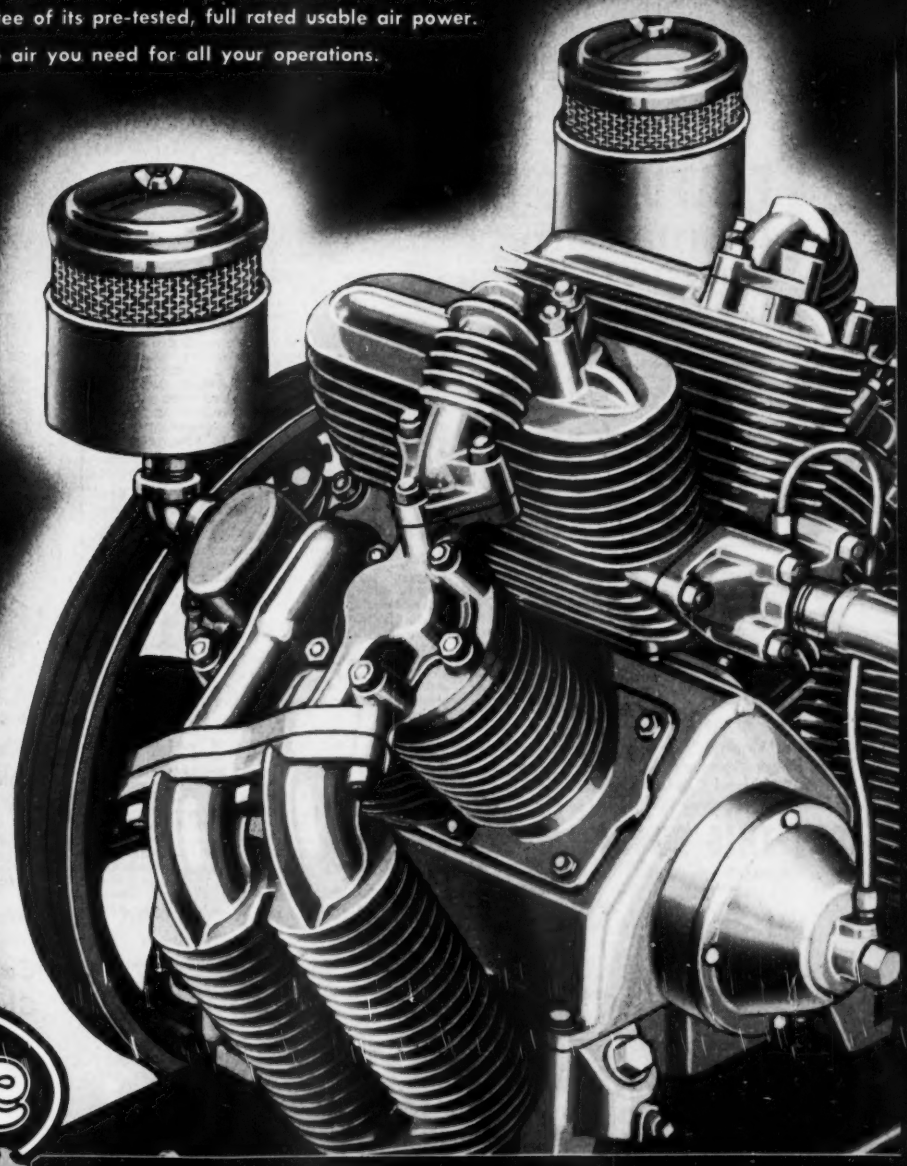

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(Begins on page 187)

and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

305 Packaged Automatic Boilers—Bulletin 1219, 16 pp, describes company's Powermaster packaged automatic boilers in 17 sizes from 15 to 500 hp for steam process and steam and hot water heating service. Orr & Sembower, Inc.

306 Water Tube Boilers—Features of company's Type "C" boiler, described in Bulletin SB-49, include large water holding capacity, fast steaming, large steam relieving surface, and production of superheated steam from a standardized design. Discusses method of steam take-off through a bank of tubes into a header. Gives dimensions. Erie City Iron Works.

307 Scotch Boilers—Catalog 98, 6 pp, describes Scotch boilers for high and low pressures, designed for oil or gas firing, and suited for use with oil, gas or combination burners. Provides ratings, dimensions. Kewanee-Ross Corp.

308 Package Boilers—This illustrated bulletin describes and lists manufacturer's line of water tube package boilers in 12 sizes from 6,000 to 39,000 lb of steam per hour and for pressures to as high as 900 psig. Contains full information on dimensions and weights. Stresses high operating efficiency with oil, gas or combination firing. Springfield Boiler Co.

HEATING, COOLING

309 Buying a Portable Heater?—Stressing safety factors involved, this 40-pp booklet, "Guide to the Selection and Use of Portable Space Heaters," analyzes temporary heating equipment from standpoints of personnel well being, property protection and fire and accident prevention. Classifies basic types of direct- and indirect-fired portable heating devices, giving their advantages and limitations. Provides a guide for evaluating portable heaters in terms of design, construction, operation and safety. Herman Nelson Div., American Air Filter Co., Inc.

310 Engineering Data for Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

311 Selecting a Heat Exchanger?—Now available is a handy heat exchanger calculator for use in selecting this company's shell-and-tube type heat exchangers. Designed like a slide rule, it is used to determine square feet of surface necessary to transfer a given amount of heat between oil or water on the shell side and water on the tube side. Young Radiator Co.

312 Radiant Heating, Cooling—This interesting folder provides a discussion of radiant heating and cooling and the practical application of radiant energy heating to human comfort conditioning. Includes drawing and photo of a multi-purpose functional ceiling affording radiant heating, cooling and acoustical control. Burgess Manning Co.

313 Heat Transfer Equipment—An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

314 Industrial Dry Coolers—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium size unit.

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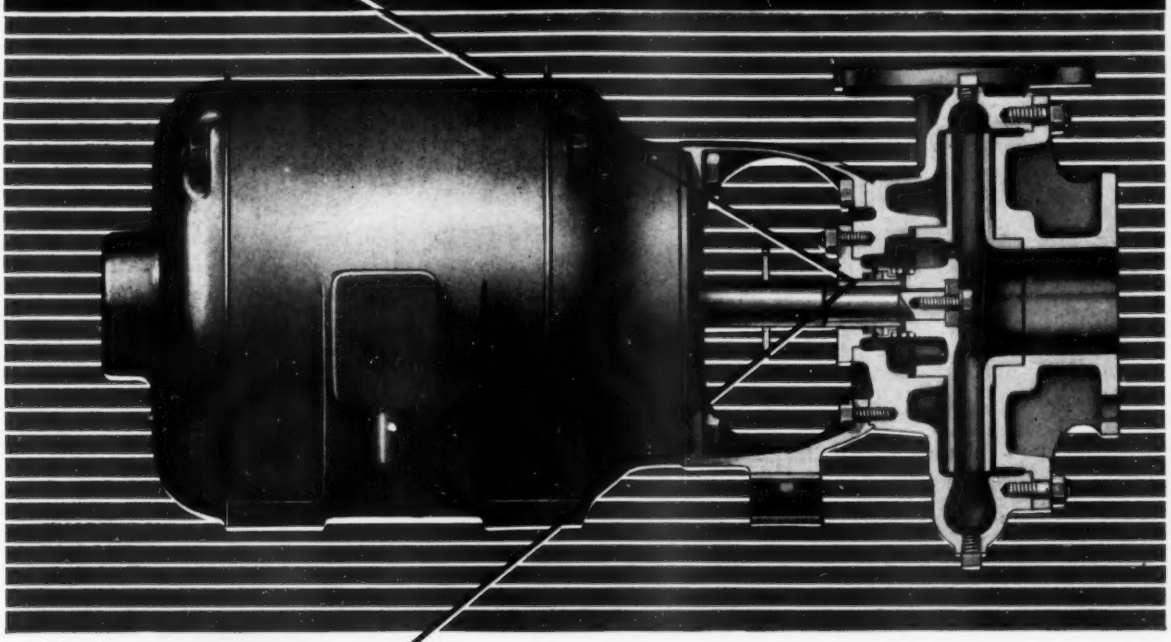

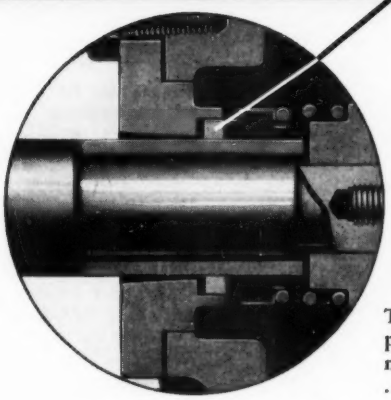

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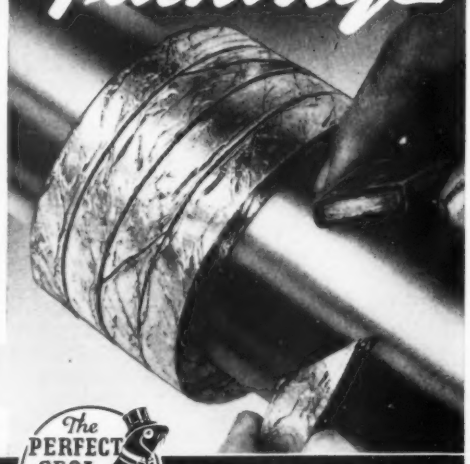

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LUBRICANTS, LUBRICATION

315 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

316 Versatile Industrial Oil—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil, explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors; hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

317 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

318 Lubrication of Chain Drives—Vol. 39, No. 8 of Lubrication offers a 10-pp discussion on chain drives and their lubrication. Covers types of chains, conditions affecting their lubrication, choice of lubricants. Includes table showing lubricant recommendations for chain drives. Generously illustrated with photos and sketches showing chain arrangements, methods of lubrication. The Texas Co.

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319 Automatic Lubrication—Sixteen-pp Catalog L-52 describes force feed lubricators for all types of machinery. Illustrated, gives full design and construction details on company's open and enclosed type lubricators, available in capacities from 2 to 32 pints with 1 to 24 feeds per unit. Hills-McCanna Co.

320 Centralized Lubrication—Featuring selection charts covering low and high pressure fluid lubrication systems for a wide range of industries and providing an explanation of operating principles of various types of systems, 24-pp Catalog 80 covers company's lubricant application equipment. Describes and pictures lubricant pumps, transfer and dispensing equipment. Lincoln Engineering Co.

WATER TREATING

321 Information on Ion Exchangers—Here are three booklets on ion exchangers: Nalcite HCR, a styrene type cation exchanger; Nalcite SAR, a strongly basic anion exchanger; and Super Nalcolite, a synthetic gel type zeolite for cation exchange. Tables and graphs explain performance of these water treating resins under various operating conditions. Physical characteristics, exchange capacities, regeneration techniques discussed. Bulletin 57, 20 pp, is on Nalcite SAR; Bulletin 58, 28 pp, Nalcite HCR; Bulletin 59, 8 pp, Super Nalcolite. National Aluminate Corp.

322 Boiler Scale—Formation and Prevention—Technical Paper 98 is a 12-pp article covering the cause and prevention of boiler scale. Covers the mechanism of scale for-

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DATA FILE

(Begins on page 187)

mation, effect of boiler scale, chemistry of scale formation, internal chemical treatment and chemical correctives. Diagrams of feeder systems, photos and solubility charts illustrate text. W. H. & L. D. Betz.

323 Solids Contact Reactor — Bulletin 5001-A, 24 pp, discusses a solids contact reactor for clarifying and/or lime softening of water. Explains advantages of this principal, including its catalytic effect, accelerated reactions and larger precipitates, cutting down of detention time, and saving of chemicals. Illustrates basic reactor types available. Cochrane Corp.

MATERIALS HANDLING

324 Data on Tramrail Equipment—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

325 Engineered Monorail Applications—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

326 Materials Handling Equipment—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

327 Tubular Conveyors — Form HC-541 contains about 44-pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

328 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

329 Conveyor and Elevator Belting Tips—This 32-pp manual on installation, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing and fastening are also covered, and there's a table listing common conveyor belt maintenance problems with their causes and remedies. The B. F. Goodrich Co.

330 For "Floor Level" Handling—Junior facturer's conveying systems are being used in handling dry pulverized and granular materials is shown in illustrated Bulletin FK-26, 16 pp. Types of systems and component parts are described and many typical installations pictured. Fuller Co.

331 Industrial Truck Reference Guide—Bulletin 300, 44 pp, covers company's line of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded by an analysis of applications and merits of the handling system. Mercury Mfg Co.

332 Conveying Systems—How this manu- Catalog 535 the 100-pp eleventh edition of company's well known pocket-size catalog. Contains information, illustrations and specifications on fork trucks, high lift electric trucks, pallet trucks, industrial tractors, electric and hand lift trucks, steeleg skids and boxes, semi-live skids and lifters, portable elevators and cranes stacking frames, storage racks, die tables, handling specialties. Barrett-Cravens Co.

333 How to Pick a Truck—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

334 For Hopper Economy—"In Dollars and Sense" explains long run economy of company's self-dumping hoppers, showing how they operate and telling how they fit particular plant requirements. Illustrated with photos, gives dimensions, weight of a standard 1-yd model. Roura Iron Works.

335 Stand-Up Fork Lifts—Complete specifications are available on stand-up fork lift trucks in 2000- and 3500-lb capacities. These trucks feature easy maneuverability and manufacturer's Lev-R-Matic drive. Mobilift Corp.

336 Industrial Lifts—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, truck service lifts. The Wayne Pump Co.

337 How to Operate a Crane—Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the co-ordination of crane motions and includes safety rules and inspection, maintenance tips. Individual copies of this

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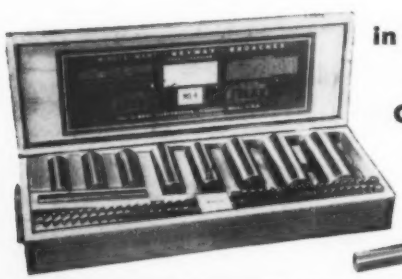

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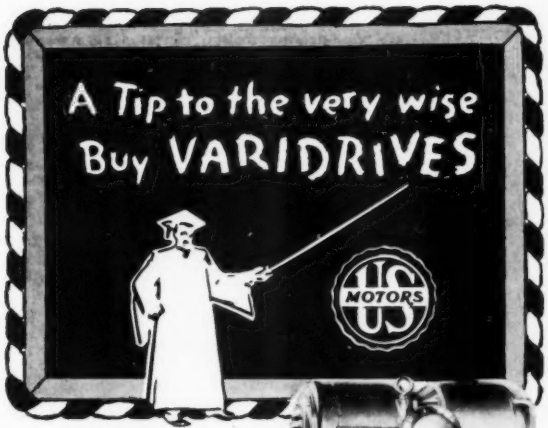

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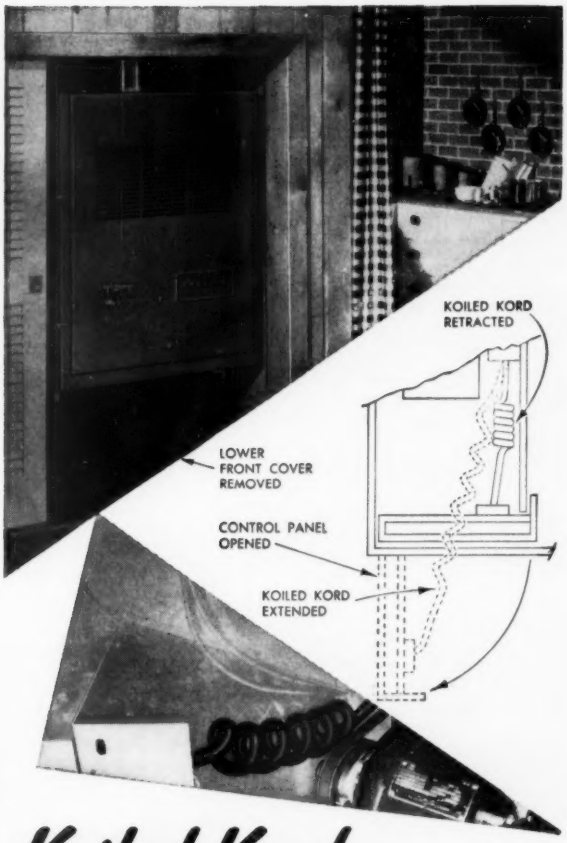

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DATA FILE

(Begins on page 187)

book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

338 Railway Car Mover—"Reports from the Field on Trackmobile Savings and Advantages" tells how this small unit travels on road and track hauls and switches freight cars and requires only one operator. Stresses economy and easy handling. Whiting Corp.

339 Chain Hoists — Catalog 61, 32 pp, covers a line of chain hoists, telling how to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

340 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

341 Shovel and Loader—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

342 Trolley Hoists—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

343 Portable Hoists—This bulletin describes a lightweight air hoist in 2000, 100, 500 and 300-lb capacities. Gives specifications, dimensions. Keller Tool Co.

344 Data on Truck Casters—As much specific information as can be presented in a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. The Bassick Co.

345 Trucks, Casters, Wheels—Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

SAFETY, SANITATION

346 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms. Scott Paper Co.

347 Group Washing Equipment—Washfountains designed for modern group washing requirements for industrial plants, institutions are shown in Bulletin D-766. Bradley Washfountain Co.

348 Dry Chemical Extinguishers—New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

PACKINGS AND GASKETS

349 Packings and Gaskets—In this 40-pp belting and packing manual (NY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included are packing recommendation charts. New York Belting and Packing Co.

350 Industrial Gaskets—This highly informative 50-pp catalog covers an extensive line of gaskets and teflon products, including practically all types of metal, metal-asbestos and special gaskets as well as teflon stock. Includes both engineering and ordering data, application and installation tips. United States Gasket Co.

351 Shaft Seals—Form 455, 12 pp, presents a mechanical seal that rotates with the shaft and is designed to meet sealing requirements of centrifugal and rotary pumps, agitators, blowers, other rotating equipment. Explains advantages of these seals, gives recommended uses for six types, also for a double seal and a cartridge, sleeve seal. Durametallic Corp.

Postage-free Reader Service Cards make it easy to order any of this literature. See pages 37-38 and 185-186.

352 Metallic Packing—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

353 Long Wearing Piston Packing—Form 4502, 8 pp, presents composition cups for packing pistons of air and hydraulic cylinders and reciprocating pumps. Engineering information covers properties, textures, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

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ROURA Self-Dumping HOPPERS SAVE TIME and MONEY

The business principles that stand behind a product's manufacture mean more than *just* selling any one job. Roura Hoppers are ruggedly built, not to only carry the load, but to stand up under the abuse that all materials handling equipment receives from average lift-truck operators. We have found that it's not the load that destroys equipment but the use and manner that lift-truck operators have of banging into all equipment of this type.

Slash production costs . . . get these 4 plus features: 1. Submerged arc welds that are "stitched" with the same apparatus used for "stitching" high pressure steam boilers, assuring long life; 2. Exclusive, patented instant release handle; 3. Simple, safe material handling; 4. Quality-built, it pays for itself *fast* many times over. Handling wet or dry, hot or cold bulky materials quickly and easily, Rouras require only one man for distributing and unloading —he does it in a lot less time than under old fashioned methods.

Sizes ½, ¾, 1, 1½ and 2 cubic-yards. Rouras are built to fit either fork or platform type lift-trucks. Can also be had with special combination fork-platform skid, or with a live skid. Can be equipped with special flanges to permit stacking for storage or future distribution of materials, solving floor space limitations.

Only ROURA Has The Exclusive PATENTED Instant Release Handle

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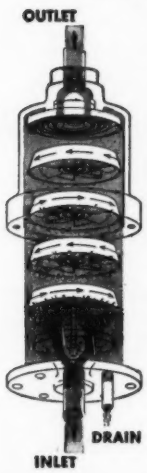
SCRUBS, CLEANS AND DRIES
On Air and Gas Lines



LASTS LONGER because . . .
The Aridifier's patented centrifugal-baffle action traps 92% of all dirt, oil, scale and water in gas or compressed air . . . and drains off these troublemakers *before* they can damage tools and equipment.

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The Aridifier protects tools against the freezing, fouling, caking and corrosion caused by dirt and foreign matter . . . assures the clean, dry air and gas that means better spray work, painting, lacquering, sand blasting, air cleaning, and similar operations.

Easily installed, the Aridifier maintains itself. 10 models. Capacity range; 7 CFM to 17,000 CFM.

Learn HOW the Aridifier scrubs with a patented centrifugal-baffle action.

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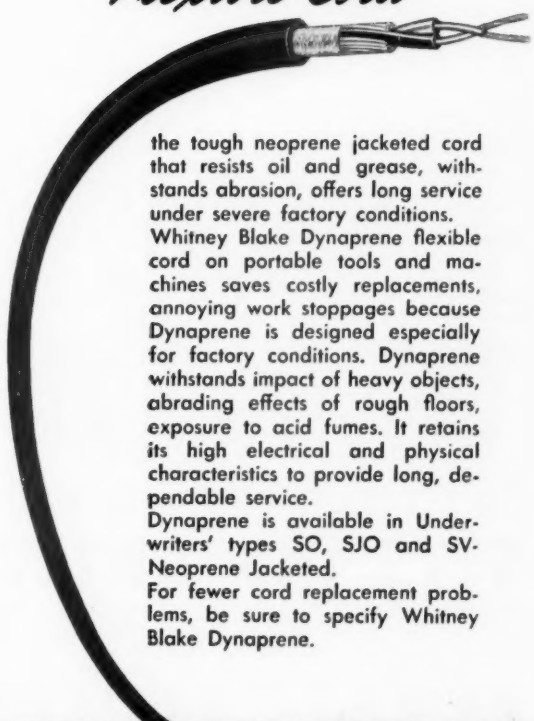
SAVE ELECTRICIANS' TIME

REDUCE PORTABLE TOOL DOWN TIME

with

DYNAPRENE®

Flexible Cord



the tough neoprene jacketed cord that resists oil and grease, withstands abrasion, offers long service under severe factory conditions.

Whitney Blake Dynaprene flexible cord on portable tools and machines saves costly replacements, annoying work stoppages because Dynaprene is designed especially for factory conditions. Dynaprene withstands impact of heavy objects, abrading effects of rough floors, exposure to acid fumes. It retains its high electrical and physical characteristics to provide long, dependable service.

Dynaprene is available in Underwriters' types SO, SJO and SV-Neoprene Jacketed.

For fewer cord replacement problems, be sure to specify Whitney Blake Dynaprene.

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(Begins on page 187)

355 Braided Rod Packing—This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustrations of types available, tables of service recommendations, specifications. The Garlock Packing Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

356 Pipe Tool Book—This catalog and data book gives information on pipe and bolt machines, power units, rachet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

357 For Faster Fastening—Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

358 Idea Book — Sixty pages of "1001 Shortcuts" for production, construction and maintenance make this hand-tool and hydraulic-tool handbook one of the most useful ever. Large photos and concise descriptions give ideas developed and successfully applied by hundreds of tool users. One of the big values attached to the "Idea Book" comes from the manner in which it stimulates the user to create his own ideas. Typical job photos suggest the applications. Blackhawk Mfg. Co.

359 Metal Spraying Gun—Company's Type 4E gun for high-speed spraying with all metals is described in Bulletin 94. A cutaway drawing shows construction features of the gun which is designed for tool-post mounting or hand operation. Metallizing Engineering Co., Inc

361 Pipe Tool Ordering Guide—Catalog 2-51, 8-pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

362 Machine Tools, Their Lubrication — A history of machine tools, an explanation of their mechanical aspects and an analysis of the role of lubricants in their maintenance and operation are contained in this 80-pp booklet. Not a manual on tool lubrication, this book is a comprehensive discussion of fundamental factors in the construction, operation and maintenance of modern machine tools. Shows how power is controlled and force directed to shape metal by cutting and chipping; analyses factors that contribute to friction and wear; and describes role of lubricants. Shell Oil Co.

363 Improved Cutting Oils—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty to heavy duty operation on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain activc-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

364 Resistance Welding —Featured in this 24-pp catalog are newly-designed tips and holders recently added to company's equipment. Full information is also given about other holders, tips, seam welder wheels and shafts, and bushings, in manufacturer's line, as well as flash, butt, barrel and other welding dies. Ampco Metal, Inc.

INSTRUMENTS, CONTROLS

365 Industrial Controls—Catalog 8305, 84 pp, describes and illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity; also pneumatic and electric valves, switches and relays. Indexed and compiled for easy use, catalog provides specifications, dimension drawings, application data and ordering information. Industrial Div., Minneapolis-Honeywell Regulator Co.

366 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

367 Wide Range Regulator—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

368 Gages for Many Jobs — Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

369 Handbook on Automatic Controls—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level, bottles; transformer-relays, valves. The Mercoid Corp.

OTHER EQUIPMENT

370 Plumbing, Heating Supplies—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, gives sizes, intended uses and necessary ordering information. J. A. Sexauer Mfg. Co., Inc.

371 Hose and Tubing—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

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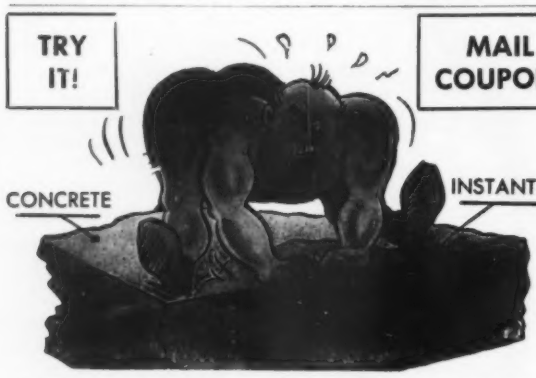

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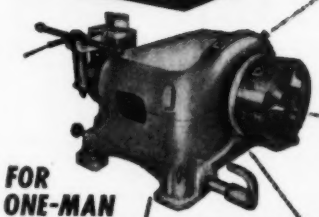
Beaver No. 102 — P D Wide Roll Pipe Cutter made especially for power drives.



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FOR ONE-MAN OPERATION AND PORTABILITY

- Works on bench, truck or pipe legs!
- Flat top serves as tool tray!
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- Approximately 100 lbs. net weight!
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- Bronze spindle bearings!
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- Parts interchangeable with Model-C.

Model-D with drive shaft geared tools Cuts and threads up to 8" pipe.

For Better Pipe Tools . . . Buy BEAVER

210-300 DANA AVE. WARREN, OHIO

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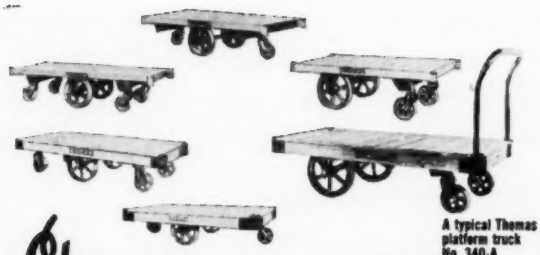
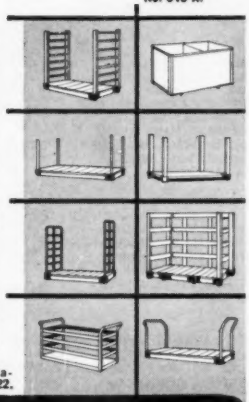


A typical Thomas platform truck No. 340-A.

Choose FROM SIX DIFFERENT TRUCK CHASSIS and 1000 superstructures



The Thomas "Job-Suited" plan enables you to choose quickly and accurately the most efficient truck for your particular freight or materials handling problem. FIRST—you choose any chassis or running gear that will *carry* your load. SECOND—you choose one of the 1000 superstructures to *hold* your load. PRESTO—you have a Thomas "Job-Suited" truck specially tailored to your needs! ANY CAPACITY, ANY SUPERSTRUCTURE, FOR ANY USE!

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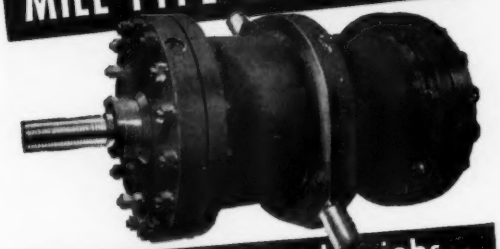

For rough and tough jobs.. .. Air and Hydraulic

Lindberg Mill Type Cylinders are heavy, tough cylinders . . with plenty of guts built in. They'll handle the meanest and most demanding job you can think of, and they'll perform dependably under the most adverse operating conditions.

Lindberg also builds a standard catalog line of heavy duty air and hydraulic cylinders . . up to 12". Hydraulic Cylinders available in 1500 and 3000 PSI. Ask for bulletin #731 (air) . . #701 (hydraulic).

LINDBERG AIR..HYDRAULIC CYLINDERS

LINDBERG ENGINEERING CO.

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. . . for removal of liquid entrainment (water, oil, etc.) from vapors-gases

Clean, dry vapor-gas (steam, compressed air) is assured at point of use since liquid entrainment is effectively separated by a scientifically designed, impingement type baffle and immediately moved to the separator drain. Separated liquid cannot be wiped or carried over or under baffle to the outlet path. Pressure loss is practically nil since areaways through separator are much greater than cross-sectional area of inlet.

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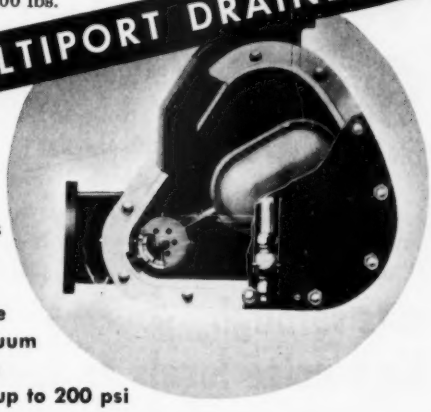

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372 Hints on Babbitting Practice—In outlining basic steps for the prevention of common bearing failures, Bulletin 146, a little 16-pp booklet, covers everything from the choice of metal for a particular bearing application through the correct pouring practice to in-service maintenance. Proper lubrication, a maintenance schedule, and operation at correct speed are discussed. Federated Metals Div., American Smelting and Refining Co.

373 Insulating Material—Ultrafine, a new thermal and acoustical insulation made of blown glass fibers, is the subject of this bulletin. Complete with photos of insulation in use and tables showing its efficiency, gives physical properties, principal uses, handling characteristics, thermal conductivity, and acoustical efficiency. Gustin-Bacon Mfg. Co.

374 Air Line Cleaner—Eight-pp Catalog 252 describes manufacturer's Aridifier, a mechanical device for removing moisture, scale and other impurities from air or gas lines. Explains, illustrates operation, shows some typical applications and gives average cfm requirements. Tells how to select proper size unit, where and how to instal it. Logan Engineering Co.

375 Aluminum in the Processing Industries—An 8 pp booklet tells of the uses of aluminum in the plastics, sulphur, petroleum, and chemical industries. Discusses company's products and lists economic advantages of aluminum. Tables give composition and properties of aluminum alloys and show applications for specific industries. Aluminum Co. of America.

376 Low Pressure Filters—Four new pipe line filter models designed for low pressures to 40 psi are introduced in Bulletin 210. Contains specifications, engineering and performance data on filters for the removal of dust, dirt, pipe scale, condensed oil and water vapor from compressed air lines. Dollinger Corp.

377 Air Preheaters—Illustrated Bulletin A-11610, 8 pp, defines air preheat and explains its benefits in terms of increased efficiency and capacity and flame stability. Describes company's Ljungstrom preheater. The Air Preheater Corp.

378 Chemical Cleaning Service—Reduced maintenance costs and outage time are among advantages of company's chemical cleaning service for steam equipment and water lines discussed in this 8-pp bulletin. Before-and-after photos show some actual cleaning jobs. Dowell, Inc.

379 Silicon Carbide Facts—Properties of silicon carbide as related to its use in abrasives, refractories and refractory cements, electric heating elements, resistors, catalyst carriers, porous media, and deoxidizers in metallurgy of iron and steel, are presented in this 52-pp booklet. Manufacturing techniques are outlined, and an extensive bibliography is included. The Carborundum Co.

380 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lighting magnets, serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

381 Hydro-Pneumatic Accumulators—Bulletin 301, 12 pp, explains the function, construction and operation of company's hydro-pneumatic accumulators, giving size and pressure data. Tells how to choose an accumulator with Boyle's law. Use of accumulators as an auxiliary source of power for intermittent duty systems, for leakage compensation, for operating secondary circuits, as an emergency source of power are discussed. Greer Hydraulics, Inc.

382 Hydraulic Hose Selector—The Wiretex rubber covered hydraulic hose selector is offered to users of hydraulic control hose. Starting with any known factor—the ID, OD, minimum burst working pressure required etc.—a plant engineer can use the selector to determine the proper hose for the job. Republic Rubber Div., Lee Rubber & Tire Corp.

383 Socket Head Fasteners—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel pin. Standard Pressed Steel Co.

384 Neoprene Design Book—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

385 Hydraulic Cylinders—Bulletin 701, 28 pp, presents a line of hydraulic cylinders offering dependability and ruggedness. Explains design advantages of the line and gives mounting data and capacities of cylinders for working pressures up to 1500 psi and those for working pressures to 3000 psi. Lindberg Engineering Co.

386 Industrial Exhaust Fan—Housing design, wheel construction and standard arrangements of manufacturer's Type EX exhausters are discussed in illustrated Bulletin C-46EX. Provides capacity tables, dimensions and photos of standard and special fan. Bayley Blower Co.

387 Air Cylinders—Bulletin A-105G uses only 8 pp to present complete engineering, design, construction and mounting data (including all mounting drawings) and dimension tables covering 13 mounting styles in 1½ through 14 in. bores. It's designed for easy selection of proper model. Covers cushioned and non-cushioned cylinders, single and double acting, single and double rod end, spring return and over-sized rod cylinders. Miller Motor Co.

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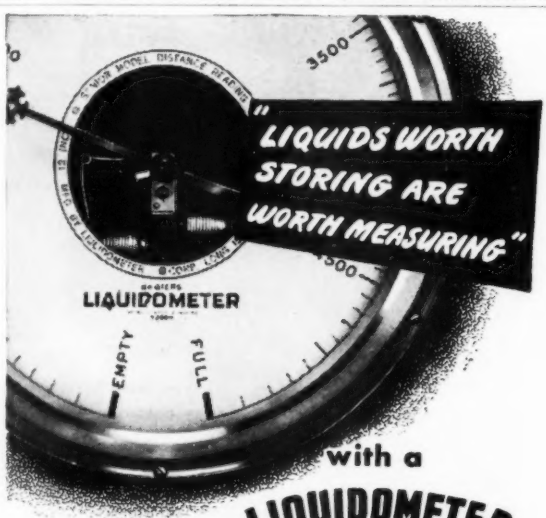

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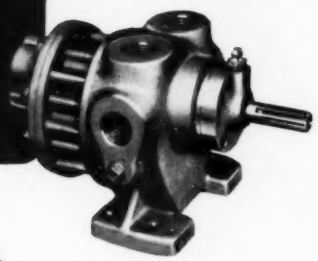

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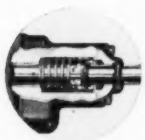

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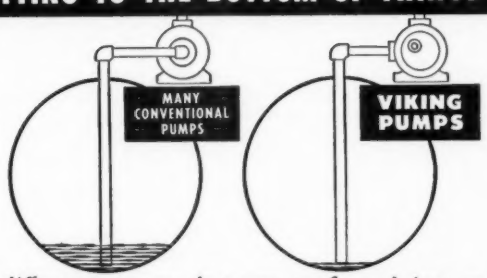

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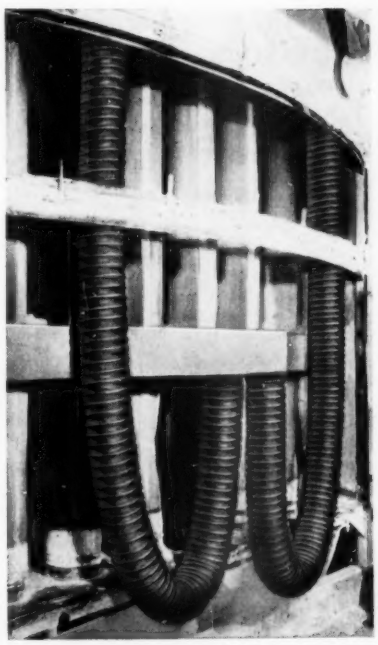

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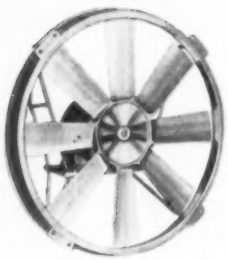

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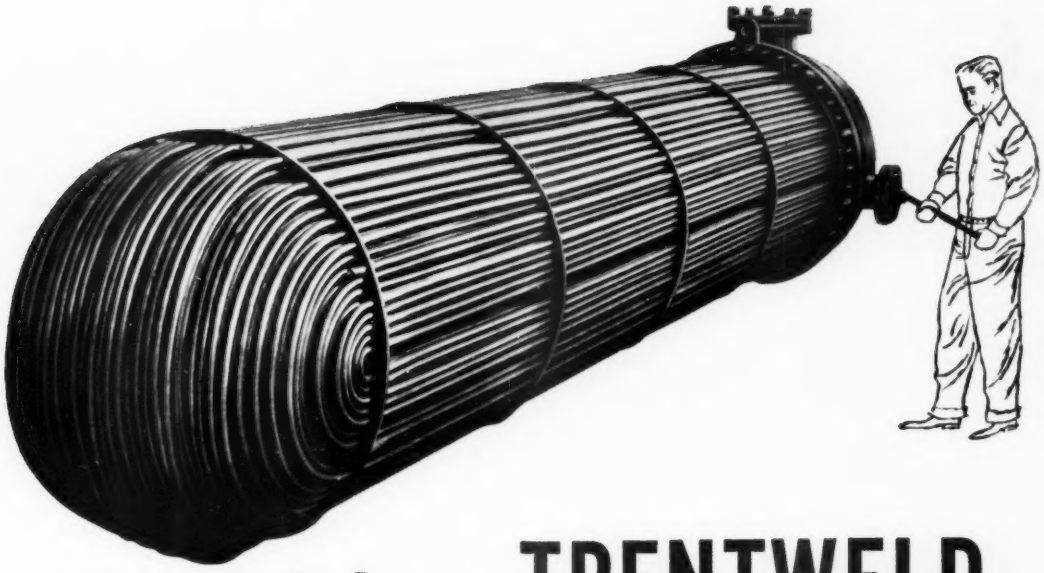

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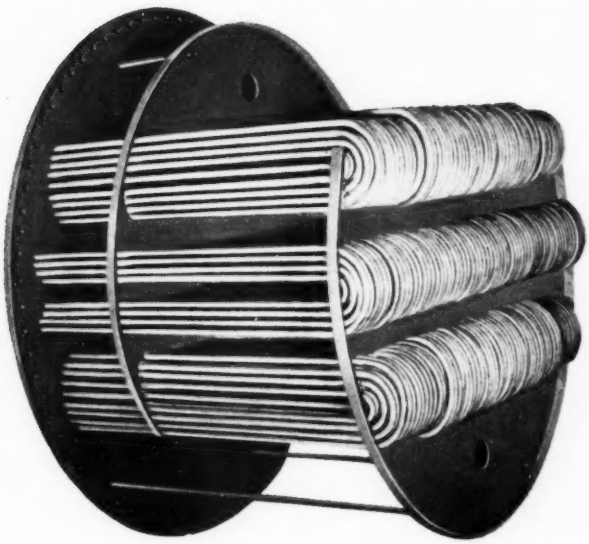

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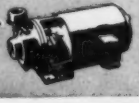

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